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THE CHICAGO POLICE TELEPHONE AND PATROL SYSTEM.

From time to time during the past year mention has been made in this paper of the inception and development of the police telephone and patrol system in operation in Chicago. A recent visit of our artist to that city enables us now to lay before the readers of the SCIENTIFIC AMERICAN the accompanying illustrations of the apparatus employed in this very important application of electricity to the mechanism of civil life and civic government.

In every American city the police departments have been prompt to make use of the systems of electric communication which have been set up for social and commercial purposes; and in several instances special telegraphic or telephonic lines have been established for purely civic uses; but Chicago takes the lead in adopting electricity and electric communication as an essential factor of the police system, making it, perhaps, the most important and efficient element of the police service. When the entire area of the city shall have been covered by the system the analogy between the civic organization and the nervous organization of an individual animal will be curiously complete. The civic organization will become sensitive, so to speak, at every point, and the transmission of intelligence therefrom to the brain and subordinate nervous ganglia—that is, the central and district police stations—will be practically instantaneous.

The object of the system is twofold: to increase the promptness and efficiency of police attendance in cases of emergency, and to lessen the number of patrolmen and the consequent expense of the police force. The urgent need of a public watchman or constable at any particular point in any American community is altogether exceptional, and the tendency is therefore to give the policeman a long beat to traverse. The chances are that he will be out of the way when an accident happens; and evil-doers may take advantage of his known absence to disturb the peace or invade the property rights of citizens. To provide against such exigencies by largely increasing the number of policemen is obviously much less economical than to quicken the working of the police system by putting every patrolman within the reach of instant communication with the substation to which he is attachent or if need be with the central station or police headquarters, at the same time giving every orderly citizen, in case of need, the means of calling upon the same authorities with the least delay.

This is just what the Chicago system aims to do. At convenient points district stations are established, with relays of policemen and a horse and wagon always in attendance. The wagon carries a stretcher, blankets, and other appliances for receiving and properly treating sick or injured persons, lost children, or persons accused of crime. In telephonic connection with the district stations are public alarm stations, like sentry boxes, placed at suitable points along the streets. As will be seen in the large illustration, the alarm boxes are just large enough to hold one man, who may lock himself in should privacy or special security be an object. Keys to these alarm boxes are furnished to respectable citizens and are carried by all policemen, who also carry a releasing key, by means of which the general key can be withdrawn from the lock. This is to secure the attendance of the person giving the alarm and prevent possible trifling with the system, each key being numbered and the holder's name registered.

The artist has chosen an accident for illustration. The moment of such an occurrence the nearest citizen holding a key hastens to the alarm box, and by depressing the lever which projects from the signal box transmits the arbitrary call for help to the district station. Instantly a detail of three men with the patrol wagon hasten to the point whence

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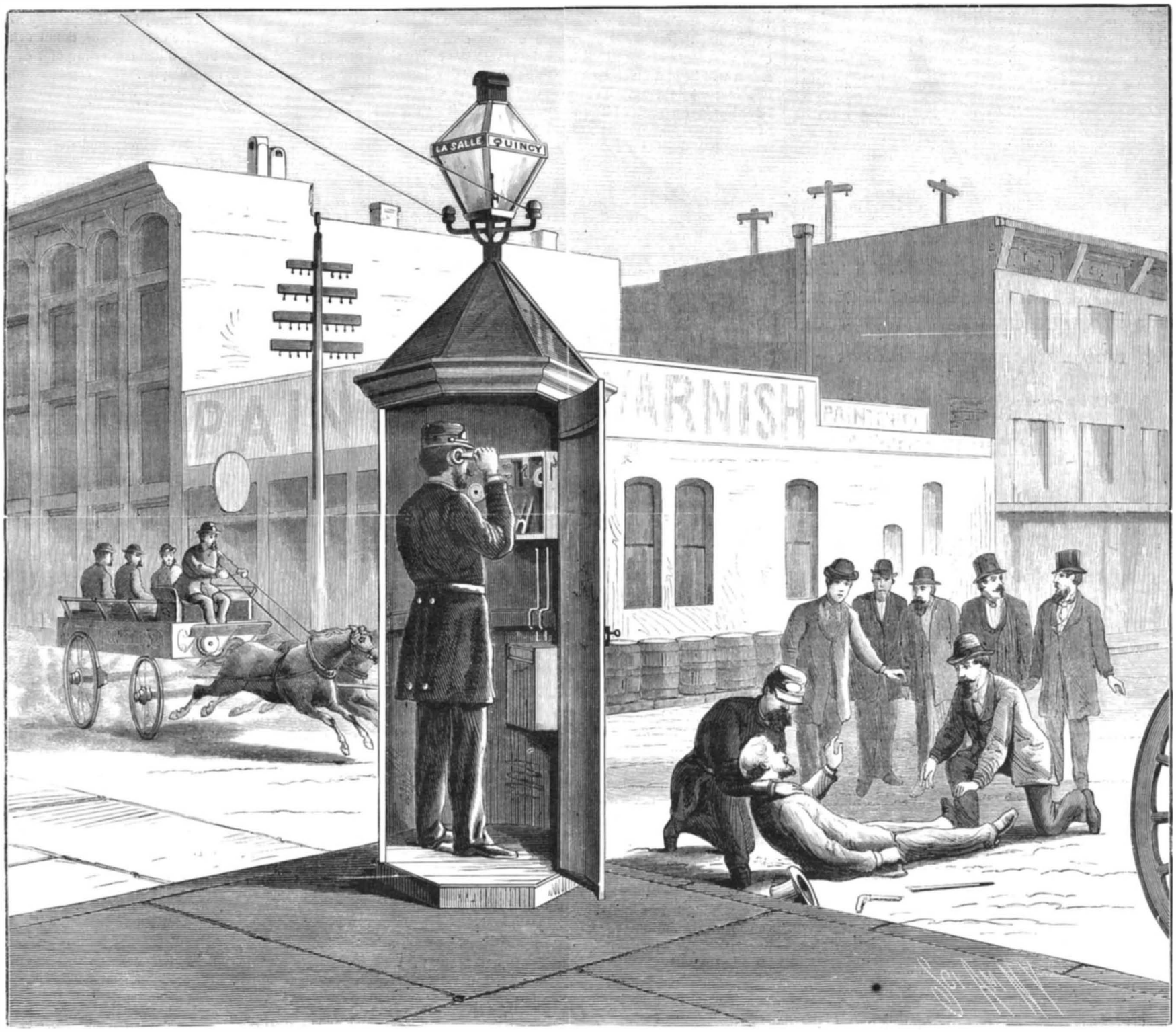

THE CHICAGO POLICE TELEPHONE AND PATROL SYSTEM.

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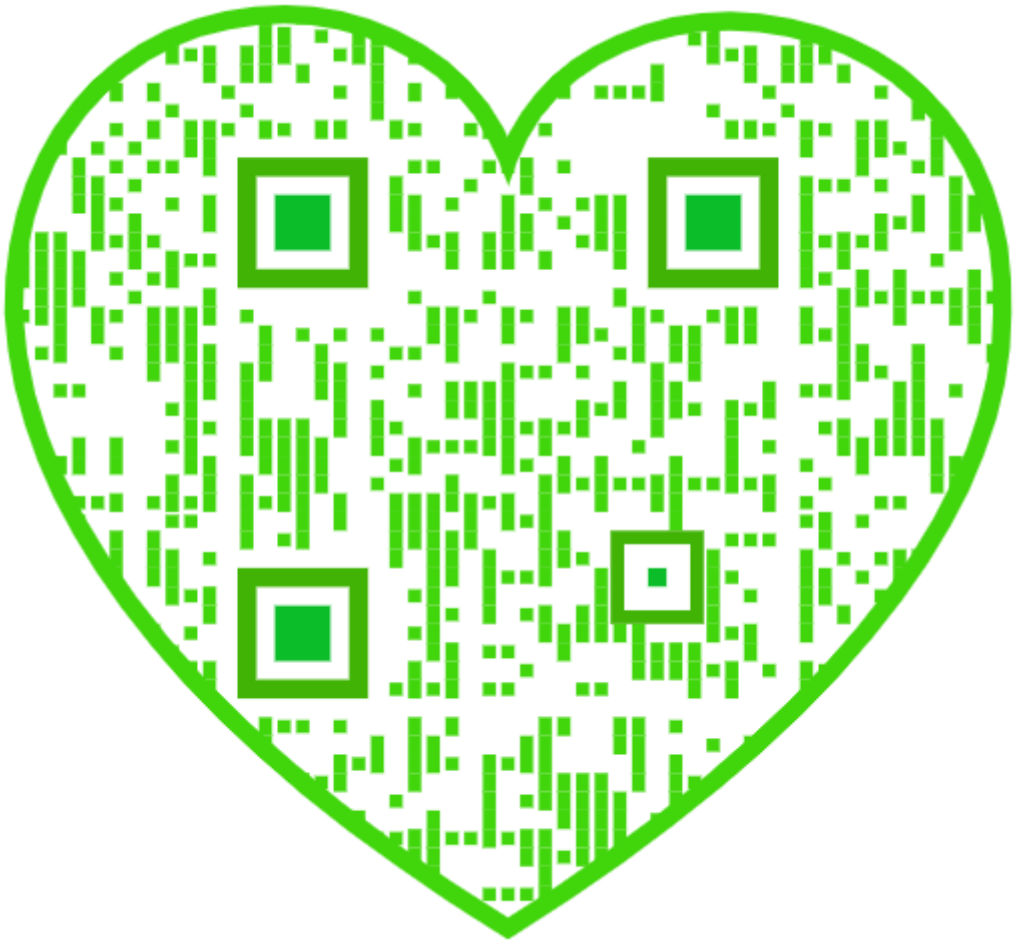

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LEGISLATING AGAINST PROGRESS.

That particular phase of unwisdom which shows itself in opposition to departures from the beaten track of custom is not confined to any locality or greatly influenced by geographical lines.

Two striking illustrations of this unpleasant fact appear in the news columns of a single morning paper. One hails from Mississippi, the other from Connecticut. The first announces that a certain Mississippi planter wanted to turn his land into a stock farm. His cotton growing neighbors protested against the change on the ground that the grass of the stock farm would spread over the adjoining plantations and spoil the land for cotton. They did more; they applied to a court for an injunction to restrain their innovating neighbor from sowing grass seed, and got it! This decidedly reverses the proverbial saying about the beneficent character of the man who makes two blades of grass grow where but one grew before. The Connecticut illustration of anti-progressiveness is even worse.

Along the Connecticut shore the succulent oyster furnishes the most important and remunerative crop, though but comparatively a small portion of the Long Island Sound bed suitable for oysters is yet under cultivation. The chief obstacles to the greater extension of the oyster industry lie in the expense of handling the crop in deep water, and the impossibility of protecting the deeper beds from the inroads of star fish and other vermin, that is, by the old-fashioned means of dredging. Accordingly the more enterprising oystermen have lately substituted steam power for sails and wind in navigating their boats, and the same motive power in place of human muscle for hauling the dredges. The consequence is that oyster cultivation can be economically carried on in deeper water, and a great deal more can be done at all times in handling the crop and fighting its enemies since the workmen are not dependent on favorable winds, which may fail or become unfavorable just at the critical moment. The time is surely coming when the bed of Long Island Sound will be covered with oyster farms for the supply of half the continent, perhaps half the world, the cultivation being done, as it only can be, by steam; the oyster farmers uniting most likely in maintaining a steam patrol whose chief business will be the destruction of the vast swarms of star fish which periodically invade the Sound and ravage the oyster beds, whose owners are unable to cope with them single handed. It is manifest destiny that steam will be and must be relied upon in the development of this great industry. Yet the State Legislature of Connecticut has just passed a bill substantially prohibiting the use of steam dredging, on the ground that it tends to create a monopoly and drive out of the business the men who cling to the slower method of dredging with sail boats.

Ostensibly the bill, we believe, does not undertake to suppress steam dredging on private grounds, that being clearly impossible; but the practical working of the law, if it is enforced, will be nothing less than that. In dredging an oyster bed in water of any considerable depth, the dredging vessel must of necessity pass beyond the boundaries of the bed even where they are clearly marked. Accordingly the steam dredger is always liable to the charge of working "off his ground" and to the risk of having his vessel restrained from operating at a time when cessation from work will be fatal to his crop, when an invasion of star fish is to be combated for example.

If steam dredging is to be prohibited because it gives the steam user an advantage over the man who runs a sail boat, then the latter should be restrained for the advantage he enjoys over the man who has only a row boat; and the oarsman because of his advantage over the man who has no boat and gets his living by "treading." There is no logical halting place between original barbarism and the largest possible use of all the working appliances which invention and art can furnish, whether in oyster culture in Long Island Sound or in the cultivation of Mississippi plantations.

With all due deference to the Mississippi court and to the Connecticut Legislature, we are inclined to think that their attempts to arrest necessary and inevitable progress will be no more successful in the long run than they are momentarily creditable.

OUR CITY SEWERAGE.

How to utilize the feculant matters discharged by our sewers is as yet an unsolved problem, although it has received the close consideration of the best engineers and sanitarians. The fecal and other matters of manurial value discharged into them is so diluted with water as to be of but comparatively small value. To save its most valuable products would require the transportation of the water in which they are dissolved. If this could be done cheaply, one of the most powerful and useful manures known to agriculturists would be utilized. As at present constructed, the sewers discharge their contents into the salt water rivers on either side of the city. Now, it is a well known fact that water, holding in mechanical solution or suspension any substances, will precipitate them when coming into violent contact with any body of greater density than itself. Consequently the fresh water from the sewers when discharged against the salt water at the docks immediately precipitates the material which it holds in mechanical solution, what it holds in chemical solution being carried off, lost, and unutilized. This action is greater at the influx of the tides, and is proportional to the momentum of the movement of the tide and the rapidity of the flow of water in the sewers. It is this which mainly causes the enormous deposits of mud in our docks, and necessitates a large expenditure of money for dredging and its removal seaward. It, in fact, makes enormous silt basins of our docks.

The consumption of croton water in this city is about 100,000,000 gallons daily, equal to 400,000 tons weight (2,000 lb. to the ton). As this enormous weight is immensely increased by the fecal and other matters discharged into the sewers, it will be seen that it would require an enormous amount of mechanical power to remove the whole. To let the fluid matters flow off, and retain the solid matter in silt basins for manurial purposes, would scarcely pay, as the most valuable fertilizing salts in the sewerage are so readily soluble in water, that what is left of them in the silt is but of comparatively little value. If the fluids could be saved it would be necessary to provide some absorbent for them; this might be found in the dry ashes when screened from the cinders intermixed with them. But the great outlay in preparing the silt basins and the other mechanical arrangements necessary for the purpose will probably always remain a bar to the solution of the question. Yet, the experiment might be worth trying with one of the sewers, in order to ascertain whether it would pay. In such an experiment the silt should also be saved and its manurial value properly ascertained. The salt water would have to be carefully excluded.

An Eight Thousand Dollar Bible.

The third part of the sale of the collection of books of the late George Brinley, of Hartford, Conn., was completed in this city April 7.

The most notable book sold was the Gutenberg or Mazarine Bible, which brought $8,000. Though this copy bears no date it is supposed to have been printed between 1450 and 1455, the printing probably occupying the greater part of the five years. For four centuries the book lay buried in the obscure library of the Predigerkirche, at Erfurt, where it was discovered some fifteen years ago. It was purchased by Mr. Brinley in 1873.

This Bible belongs to the extraordinarily rare first edition, and may properly claim to be the first book ever printed with types. The text is the vulgate of St. Jerome. The type is Gothic, and not only the hundreds of illuminated capitals, brilliantly colored and decorated, but the paucity of typographical errors and the nice execution of detail evince its title to precedence of many other copies in point of origin, and its production as an exemplar. The capitals are many of them emblazoned with ornamentation in gold, and the two volumes are in the original binding—thick oak boards sheathed in calf, beautifully stamped, protected at the corners with ornamented shields of brass, and decorated at the center with designs in the same metal and bosses. The edges of many of the leaves are uncut and show traces of the cues of the rubricator. They are very broad, measuring 15⅛ by 11½ inches on the leaf.

The book is without title-pages; there is no pagination. The 641 leaves are printed in double columns, of 42 lines each, and the initials and rubrics are in manuscript. The large folio volumes are of nearly equal thickness, the first, of 324 leaves, ending with the Psalms, and the second, of 317, completing the text. One leaf of the first volume is in facsimile and sixteen of the second. The copy is in an excellent state of preservation, unstained by time or mildew, and has evidently never been washed. The decoration is arabesque, and Dr. Trumbull infers from its general sumptuousness that it was originally intended for the library of some prince or nobleman—possibly some kindly patron of the struggling inventor.

The Cuban Exhibition.

The International Exhibition at Matanzas was opened April 3, in the state of general unreadiness characteristic of such shows. The most complete display of industries is that of Cuba. Spain is sparingly represented, probably because the mail company refused for a long time to transport gratis goods intended for the exhibition. The United States is fairly represented, principally in hardware and machinery, though its agricultural products have also received some attention.

The Scio Earthquake.

Great damage was done by an earthquake in the Island of Scio, one of the best known of the isles of the Grecian Archipelago, on Sunday, April 3. In the chief town, Kastro, with 15,000 inhabitants, three or four thousand persons were killed and wounded, and but fifty houses were left standing. Later reports state that thirty villages, in other parts of the island, were wrecked, and as many as 40,000 people were made destitute. The entire number of victims is estimated at 5,000. The shocks were widely felt among the islands and along the coasts of the mainland.

The Cohahuila Aerolite.

The University of Rochester has lately purchased from Dr. J. Lawrence Smith, of Louisville, Ky., a portion of the celebrated aerolite found in the Mexican town of Cohahuila in 1866. Originally it was a mass of iron, weighing 434 pounds, and was remarkable on account of the fact that it was cracked almost through and through, so that when sawed the pieces fell apart. It was irregular in shape, but was substantially a foot square. The piece bought by the university is a chunk cut out of the middle, and is a beautiful specimen.

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PERMANENT PICTURES ON THE RETINA.

Immediately after the discovery of the visual purple by Professor Boll, and the ascertainment of the fact that it is possible to produce pictures on the retina which can be examined after the death of the animal, the question was discussed as to whether these pictures could be made use of by the legal profession in cases of murder, etc. Dr. W. C. Ayres, who has made more than a thousand experiments in the laboratory of Professor Kühne, at Heidelberg, in obtaining optograms on the retina of animals, has an article in the New York *Medical Journal*, in which he answers the question negatively.

After explaining the photo-chemistry of the retina and describing the *modus operandi* of obtaining optograms in the eye of the living animal, Dr. Ayres goes on to state that while he was working in the laboratory at Heidelberg, Professor Kühne proposed that he should make a picture of Helmholtz and send it to the latter as an acknowledgment of the value of his researches in physiological optics. Dr. Ayres, therefore, provided himself with a large negative of Helmholtz and set about making an optogram from it, according to the most approved methods. The negative was placed over the eye, which had been dosed with atropine. The animal was in the dark room for hours. The sun was shining brightly, so that there was the best of light; and every precaution having been taken, the retina was exposed for four minutes. There was a dull picture on the cornea, and when the retina was examined there was found an image of Helmholtz's shirt collar and of the end of his nose. The light was not bright enough, or rather there was not enough transmitted through the negative to bleach the visual purple. As there is always an active rhodogenesis in the living retina, and it might have been strong enough in this case to restore the visual purple as fast as it was bleached, Dr. Ayres cut off the head of a rabbit and waited until all such power on the part of the retina was certainly done away with, and then repeated the experiment. The result was a little better than the preceding, but the optogram was by no means sufficiently distinct for one to recognize even that it was intended for a picture. Dr. Ayres, therefore, came to the conclusion that such an optogram was impossible and gave up the plan.

In conclusion, he adds that since the above-described experiment failed so signally, he believes it utterly idle to look for the picture of a man's face, or of the surroundings, on the retina of a person who has met with a sudden death, even under the most favorable circumstances.

PICKETT'S CAVE.

BY H. C. HOVEY.

Every one who visits Colorado is surprised at certain features of scenery, to be accounted for only by considering the peculiar geological structure of the region.

The vast plains, sweeping from the Missouri Valley westward to the foot-hills of the Rocky Mountains, have a gradual upward slope from an altitude of only 770 feet above the sea, at Kansas City, to an elevation of 6,000 feet, at Colorado Springs. The underlying rocks, resting on one another in broad sheets, are varieties of sandstone, limestone, slate, and shale, mostly belonging to the cretaceous formation.

A glance at the geological map of Colorado shows that large areas of the mountain region are marked as "eruptive," which means that, at some period later than the formation of the plains, there was a great upheaval of the earth's crust, causing the lower rocks to appear at the surface, sometimes by volcanic violence, and at others by the slower process of denudation. These rocks are granite, gneiss, trap, and other hard species, capable of resisting the ordinary action of the elements.

Along the border line, between the plains and the mountains, is a comparatively narrow but highly interesting region, lying nearly north and south, where the rocks of the plains, instead of being flat, are turned upward and broken off by the same force that lifted the mountains themselves. It is the opinion of the geologists that these sedimentary beds once extended much further up the mountain sides than now, being gradually worn down by the retreating waters of the primeval ocean, and the subsequent erosion by running streams.

One of my summer vacations, not long ago, was spent amid the mazes of this border land, and I found it a geological paradise, where the explorer may, by guiding his course intelligently, cross the edges of all the strata, from the Archæan rocks to the Tertiary, studying the entire history of their folding and erosion, to better advantage perhaps than anywhere else on the continent.

The Monument Group of red sandstones has been repeatedly described by pen and pencil. The fanciful columns of loosely cemented sandstone, each capped by a layer of tough ironstone, that are, in Monument Park, only 10 or 20 feet high, rise to lofty castellated forms in the Garden of the Gods and Glen Eyrie, some of the needle-like spires shooting 300 feet above the green meadows at their base. These grotesque pillars are produced not only by the flowing water, but by the cutting action of whirling sand blown about them by the dry winds of summer.

Frequently, instead of standing in isolated masses, the red sandstone runs in ribs parallel to the chain of adjacent hills. These ridges are cut through at intervals, by arches, gateways, caves, and tunnels, with very picturesque effect.

The width of this border region varies from one to twelve miles. Nearest the Granite Hills its rocks seem to have been sufficiently modified by heat to acquire an obscure columnar structure, thus opening lines of weakness, which have been sought out by the water, aided by insinuating roots and the power of frost, until one columnar mass after another has been pried off and finally removed by the further action of the elements. This process results in a deep and narrow valley known as a *cañon*.

Hundreds of cañons are found in various parts of the Rocky Mountain region, some of which are of enormous dimensions. But those visited by me lie along the course of Fountain Creek, at the base of Pike's Peak, and are interesting, aside from their wonderful scenery, because affording such an excellent opportunity to examine not less than 4,000 feet of sedimentary rocks. In many of them the torrent had plowed down into the underlying feldspathic granite, giving an amazing exhibition of aqueous energy.

Williams' Cañon, near Manitou, was the last one visited, and on some accounts I found it the most interesting of all.

The mouth of this cañon is cut through the red sandstone to a limestone, at first yellowish and sandy, but improving in quality as one goes deeper into the gorge, until it is of a good quality for all purposes to which limestone is ordinarily put, and large quarries have been opened, to which a wagon road leads.

The walls rise for 400 or 500 feet on each side, in many places absolutely perpendicular, and sometimes so close to each other that both wheels of the lime carts would graze the walls in passing.

I found but few fossils, and they seemed to belong to the Silurian formation; a conclusion verified by Hayden's report, which speaks of these beds as being decidedly referable to the Silurian group. Professor Hayden adds: "I have never known of any Carboniferous fossils being found here, but am confident that there are 1,000 to 1,500 feet of these beds between the Silurian and Triassic."

On his geological map, 1876, he assigns a portion of these rocks to the Carboniferous, and also marks high ridges of Silurian limestones on the side of the mountain about four miles north.

The existence of heavy deposits of nearly homogeneous limestone under circumstances so favorable for excavation excited my curiosity as to the existence of caves in that locality. But after following the cañon for two miles or more, toward its head, nothing of the sort presented itself, except an open gorge, to which visitors had given the name of "The Cave of the Winds."

An entrance was discovered, last June, through this very gorge to a cavern of large dimensions, named for the boys who found it, *Pickett's Cave*, and described by Rev. R. T. Cross in the *Congregational News* for March, 1881.

Some progress in underground research was made last fall by an organization known as "The Boys' Exploring Association," of which the young Picketts are members. They found numerous obstructions, but noticed in one of the rooms entered a peculiar chimney-like aperture nearly closed by dripstone.

Through this chimney a passage was forced, last January, by Messrs. Reinhart and Snyder, who now own the cave. They found at its upper end a spacious hall about 200 feet long, decorated with a profusion of stalactitic formations, in some instances translucent and in others varying in color from red to pure white, sometimes coated by delicate frost-work.

A canopy was observed on one side of this hall perforated by the rotary action of water, near which was a pit partly filled, on whose sides there were singular markings caused by calcareous deposit from the evaporation of water.

Crawling for thirty feet through an "auger-hole," admittance was gained to a series of rooms containing many curious and beautiful objects, including a set of *musical* stalactites!

Through a deep pit they descended by means of a rope into other apartments; while to reach others still they had to climb steep acclivities, or worm their way through passages nearly filled by *débris* or obliterated by dripstone.

Forty rooms in all have thus far been explored; and according to the account given the attractions increase as exploration penetrates the mountain side. Shining crystals, tufts of satiny fiber, slender arms mimicking growths of coral, rams' horns twisted and intertwined in every conceivable way, pillars and pendants, statuettes and grotesque resemblances of life, are among the charms of these enchanted halls.

Vandals have, of course, despoiled the rooms first opened, and the discoverers had a right to take a few choice specimens to be placed in college cabinets, where they could be seen by the public. But now we are pleased to see that the rules forbid any one's taking specimens, or even entering unaccompanied by a guide.

It is stated that "after entering the cave it takes about two miles of travel to explore every part of it." But the proprietors are building stairways and enlarging the narrow places, so as to enable visitors to go the round without serious fatigue. They promise also to improve the wagon road to a point near the cave, and to make steps up the wall of the cañon, to facilitate the ascent of nearly 200 feet that has to be made at an angle of 40° to gain the entrance to this subterranean realm.

If Pickett's Cave is, as I infer, excavated from Silurian limestone, that itself is a remarkable circumstance; for some of the most celebrated geologists in America have recently expresssd "grave doubts whether in a single case Silurian caves extend much beyond the light of day." I have, in previous articles in the SCIENTIFIC AMERICAN, referred to Hanover Cave, a mile and a half long, and Howe's Cave, three miles long—both of them Silurian caves; and now we may add Pickett's Cave, said to be two miles in length.

It must be admitted that such cases are exceptional, the rule being that most Silurian caves, at least such as I have examined, are considerably wider at their entrance than at any point within.

It also remains to be ascertained if Pickett's Cave really is in Silurian rocks, or pierces through to the Carboniferous formation famous the world over for its cavernous structure.

Further particulars may hereafter be given as new discoveries are made. But it cannot be doubted that one more great attraction is added to the wonderful region that boasts of Monument Park, Glen Eyrie, the Garden of the Gods, Manitou Springs, Pike's Peak, and other glories, all within a radius of ten miles!

The Concord Summer School of Philosophy.

That remarkable and characteristically American expression of interest in philosophy, the Concord summer school, proved so successful last year that it is likely to become a permanent institution. Nearly six hundred different persons were in attendance, the average number present being about seventy.

The term for the coming season will begin July 10, and continue five weeks, with upward of fifty lectures in all. The following lecturers and subjects have been decided upon, and others will probably be added:

Mr. A. Bronson Alcott, dean of the faculty, five lectures on "The Philosophy of Life;" Mr. Alcott will also deliver the Salutatory and Valedictory. Mr. E. C. Stedman will read a poem at the opening session, July 10, 1881. Prof. W. T. Harris, five lectures on "Speculative Philosophy," and five on the "History of Philosophy." Dr. H. K. Jones, five lectures on "The Platonic Philosophy," and five on "Platonism in its Relation to Modern Civilization." Miss Elizabeth P. Peabody, two lectures: (1.) "Dr. Channing;" (2.) "Margaret Fuller." Mrs. Julia Ward Howe, two lectures. Mrs. E. D. Cheney, a lecture on "Color." Rev. J. S. Kidney, D.D., three lectures on "The Philosophic Groundwork of Ethics." Rev. W. H. Channing, three lectures. Mr. S. H. Emery, Jr., two lectures on "System in Philosophy." Mr. F. B. Sanborn, three lectures on "Literature and National Life." Dr. E. Mulford, three lectures on "Political Philosophy." Mr. Denton J. Snider, five lectures on "Greek Poetry and History." Mr. H. G. O. Blake, readings from Thoreau: Mr. John Albee, two lectures; Rev. Dr. Bartol, a lecture; Prest. Porter, of Yale College, a lecture; Mr. D. A. Wasson, a lecture.

The secretary desires that all who propose to attend should send their names to him at Concord. No preliminary examinations are required, and no limitation of age, sex, or residence in Concord will be prescribed; but it is recommended that persons under eighteen years should not present themselves as students, and that those who take all the courses should reside in the town during the term.

Beet Sugar in New York.

The first beet-sugar company in this State has just been organized, and contains some well known New York and Boston names. The factory will probably be located at Schenectady, on account of its nearness to the rich lands of the Mohawk Valley and the facilities which the Erie Canal affords for transportation. Last year about 200 acres were planted with beets in different sections of the valley to test the adaptability of the soil, and the results were entirely satisfactory, both as to quality and quantity per acre. In some cases the percentage of saccharine matter in the roots was extraordinary, reaching as high as 16·86 per cent. This excels the best beets raised in Europe, 10 per cent being the usual yield there, while 13 per cent is considered high. The farmers of the valley are said to look with favor upon the new enterprise.

Locomotives for Mexico.

About the first of March four trial locomotives were shipped from the Baldwin Locomotive Works to the Mexican National Railway, a bid to supply the road with 200 engines having been tendered some time before. A contract for the proposed two hundred has since been signed and the work of construction has been begun. The locomotives are to be shipped as wanted, and all finished before January, 1883. They are to be of exceptional power, and half of them for passenger trains, the rest for freight and general use.

A Novel Dispatch Boat.

A ship which sailed from England for Australia recently took a four-foot "life" boat, designed not to save the passengers but the records of the ship in case of accident at sea. This would seem to be a decided improvement on the conventional bottle, since it will carry more information and be more likely to be seen and picked up. The boat carries a sail, and is expected to make four or five miles an hour in favorable weather.

An Electric Fence.

Dr. J. H. Connelly, of Pittsburg, Pa., has applied to cattle the old device employed by country druggists to keep loungers from thrusting elbows through their showcases, namely, a wire fence charged with electricity. The electricity is to take the place of the barbs now used on wire fences, the aim being to repel the cattle by a slight shock, instead of by pricking with the risk of severe laceration. It is to be presumed that the doctor is not a practical farmer.

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Don'ts for the Varnish Room.

The *Coach Painter* compresses a large store of valuable advice in the following brief article:

Don't use the bucket for a washbasin, or the "shammy" for a towel.

Don't touch your work with sweaty hands.

Don't flood your floor with water; have it *clean and dry every time.*

Don't wash off your work in the same room you finish it in.

Don't fail to use plenty of clear, soft water in washing off, for if the work won't stand a thorough washing, *you understand why,* and will not look for a lasting job.

Don't apply your finishing coat, or any other, until you have completely cleaned your work, and are sure it is perfectly hard and free from moisture.

Don't let the pumice in corners, and around and under the mouldings, escape your notice.

Don't apply a cold varnish on a warm job, or a warm varnish on a cold one.

Don't keep your varnish in a damp or cold place.

Don't overload your work by laying two coats in one. A full coat *laid on evenly is all-sufficient,* and will give you a finer looking and more durable job.

Don't work your varnish too long, or leave it too soon. Become acquainted with it, and it will obey you first and last.

Don't say you haven't got a good, dry, tight, clean, clear, high-studded, and well-ventilated varnish room—*don't.*

Don't pour your varnish back into the can taken from; it will cause you trouble. Have a clean can for the purpose, and use it only after time is given to settle.

Don't keep your brushes in oil or turpentine; keep them in the varnish you use them for.

Don't use any but the best rubbing varnish (it is the cheapest in the end), and follow it with the best finishing.

Don't you know that a job turned out with a *fine finishing* varnish over a *poor rubbing*—although it may please you for the time being—will soon return to you for repainting and revarnishing?

Don't attempt to be a varnish maker by diluting your stock with oil or turps; don't meddle with it, but, if unsatisfactory, send it back to the maker, explaining the trouble.

Don't *always* lay the blame of a bad job on varnish, brushes, weather, and many other things; but look at home —*once.*

Verea's Calculating Machine.

The utility of a really practical calculating machine can scarcely be overestimated. A great deal of time has been devoted to this subject, and no little money has been spent in endeavors to perfect a usable machine of this character; but hitherto the machines have been too complicated, too bulky, and too expensive.

A short time since Mr. Ramon Verea, of 88 Wall street, New York city, patented a calculating machine involving an entirely new principle. It is comparatively simple and inexpensive, and is very compact. This machine cannot be intelligibly explained without engravings, but it may be stated that the essential features of the invention are a series of prisms perforated with holes of different sizes, and a series of tapering prisms which enter the holes more or less according to the size of the hole.

With this machine Mr. Verea can not only add and subtract readily, but he is able to perform multiplication and division with equal facility.

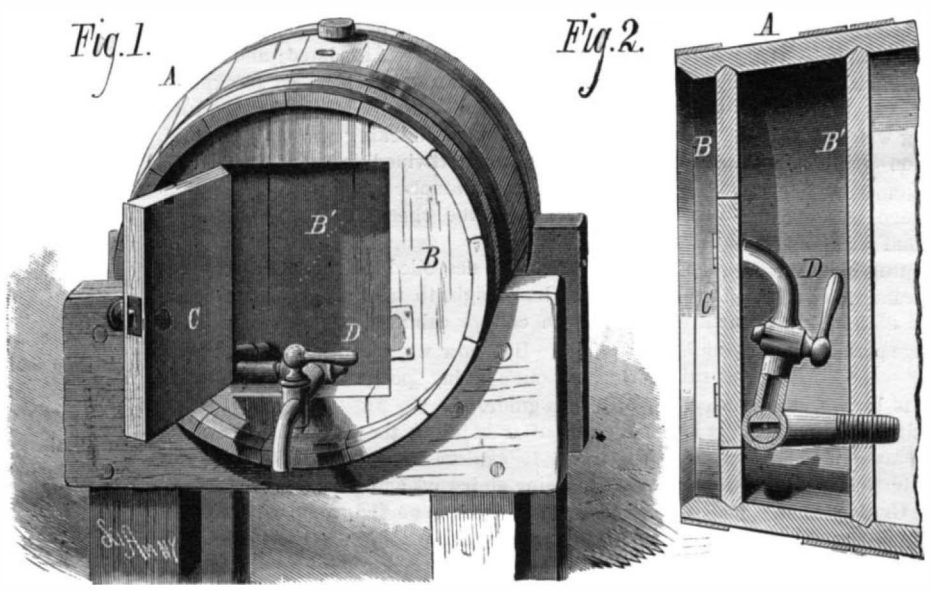
NEW COOLING CASK.

The engraving shows an improved cooling cask recently patented by Messrs. William Mainzer and John Singer, of this city. The improvement consists in providing the cask with two heads at one end, the outer head, **B**, being provided with a hinged door, C, which shuts the compartment inclosed by the outer head, B, the inner, B′, and the sides of the cask.

The faucet, D, differs from those in common use by having a joint which permits of folding it up into the compartment between the inner and outer heads. With this construction filled casks can be furnished to consumers with faucets applied to them, and can be returned to be refilled without detaching the faucets, so that the consumers will have no trouble in applying faucets, and waste of the contents by unskillfulness will be avoided.

The chamber between the two heads is wholly or partly filled with ice, which cools the liquid contained by the cask. Small kegs to which this improvement is applied may be used instead of bottles.

Further particulars in regard to this invention may be obtained by addressing Mr. William Mainzer, 200 Chrystie street, New York city.



COOLING CASK FOR BEER AND OTHER LIQUIDS.

AN EXPENSIVE FOX.—Six months ago a party of hunters tried to smoke out a fox that had taken refuge in a hole ten miles west of Somerset, Ky. In so doing they set fire to a bed of coal which has been burning ever since.

THE CHICAGO POLICE TELEPHONE AND PATROL SYSTEM.

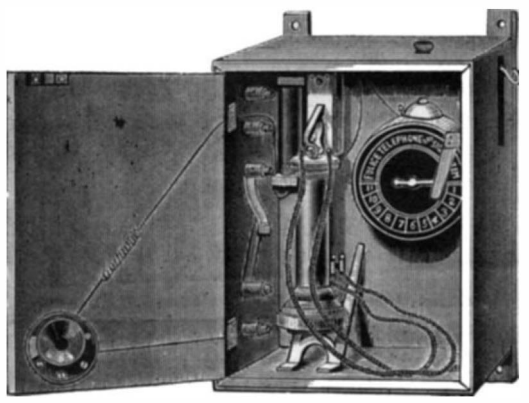
[*Continued from first page.*]

the signal came. If the policeman of the post is near he unlocks the inside signal box, shown in Fig. 2, and communi-

POLICE TELEPHONE & SIGNAL SYSTEM
DIRECTIONS:
PLACE THE POINTER ON THE SERVICE REQUIRED AND PULL DOWN THE LEVER - IN CASE THE ANSWERING GONG DOES NOT STRIKE WITHIN A FEW SECONDS REPEAT YOUR CALL
CAUTION:
DONT MOVE THE POINTER WHILE THE INSTRUMENT IS RUNNING
1 POLICE WAGON
2 THIEVES
3 FORGERS
4 RIOT
5 DRUNKARD
6 MURDER
7 ACCIDENT
8
9 FIGHTING
10 TEST P'LINE
11 FIRE

SIGNAL TRANSMITTER.

cates with the district station by means of the telephone hanging within. The specific character of the disturbance which gives rise to the alarm, whether fire, accident, riot, or what not, can also be signaled mechanically by moving the lever to the proper position. It is proposed ultimately to have an alarm bell at each signal station, so that in cases of emergency the police may be instantly called to the telephones for instructions from the district or central stations.



TELEPHONE BOX.

In the meantime every officer while on duty is required to report by telephone, hourly or half hourly, the state of affairs on his beat; and his movements can be readily watched or directed by the chief of his station.

The system contemplates also the placing of signal boxes in private houses and places of business, either with or without telephonic connection. In the latter case the directions for the mechanical signals are given on the dial, as shown in Fig. 3. When a signal box is placed in a private residence a key of the house is left at the station under seal. When a night call is made—for burglary, for instance—the policeman answering the call takes the key and is thus able to surprise the intruder.

At present the number of alarm stations established in Chicago is about one hundred, and it is expected that the number will be more than doubled during the year. The practical working of the system is said to be in the highest degree satisfactory. The efficiency of the police in the districts covered has been nearly doubled, judging by the number of arrests made, while there has been a marked decrease in the number of crimes reported.

The system requires no great outlay in its first establishment, and its running expenses are very small. This makes it especially desirable for small towns having few officers for the territory covered. By means of the house and street alarm boxes the citizens can summon instant assistance should it be needed, thus enabling a few officers to do the work of many.

Boiler Explosions in 1880.

To the Editors of the Scientific American:

Messrs.: We notice in a late issue of your valuable journal a report of the number and kind of steam boilers exploded during the past year, taken from the Hartford Boiler Insurance Company's *Locomotive.* We saw the report in that paper and took no notice of it, but when it is given the widespread circulation of your paper, we feel as if a simple statement of facts should accompany it. In that report, locomotive and steam fire engine boilers are classed together, and come third in the list in number of explosions. The boilers used in the two engines are entirely unlike in construction, and out of the large number of steam fire engines in use in this country, we know of but one explosion occurring last year. That was a "drop flue" boiler in a *test trial* where the rules permitted "unlimited steam." No explosion of a steam fire engine boiler occurred last year while the engine was doing fire duty. As the report is given, it would convey the impression that steam fire engine boilers are dangerous, and thus discourage their use, while the facts prove the contrary. None of the fire engine boilers manufactured by us have ever exploded, and probably the *three* explosions of the kind that have occurred since the introduction of steam for that purpose (we believe there have been only three in all) are the results of culpable carelessness and not due to the construction of the boiler. An experience of twenty years, under a great variety of circumstances and conditions, convinces us that they are as safe as any that are made.

Very truly yours, L. BUTTON & SON.

French Gunboats for the Pacific.

The Nukahiva, the first of a fleet of gunboats building at San Francisco, Cal., for French naval service at the Tahiti Station, Pacific Ocean, has just been launched. The Nukahiva is built of Oregon pine, and is 72 feet over all; 64 feet on the keel; 20 feet 2 inches breadth of beam; 6 feet depth of hold; and will register 75 tons. She is copper fastened, and coppered 7 feet above the keel. Her draught will be about 8 feet, and it is expected that she will sail 10 knots an hour under a fair breeze and spread of canvas. Another boat of the same type and material is to be finished in the same yard by April 20, and others are contemplated.

RECENT INVENTIONS

An improved bouquet holder which can easily be attached to a coat or dress, and which holds the flowers securely without requiring them to be bound or held with a string before being inserted in the bouquet holder, has been patented by Mr. Thomas W. Ryder, of Terryville, Conn.

An improved bucket for chain pumps has been patented by Mr. Stephen F. Lockwood, of Stapleton, N. Y. It consists of the conical elastic disk having a flat top, straight inclined sides, and a circular recess in its lower face, the line of greatest circumference of the bucket being below the top of the recess.

Mr. Willis Carter, of Nanaimo, British Columbia, has patented an improved washing machine having two curved roller washboards, one fixed and the other pivoted at the bottom, and a rubber on the end of a pivoted bar arranged to vibrate between the washboards.

An improved shaft coupling has been patented by Mr. Charles E. Marston, of Dover, N. H. It consists of two semicylindrical blocks longitudinally grooved in their flat faces, and having midway in their grooves rectangular or flat seats that serve to hold the correspondingly flattened and shouldered ends of the coupled shafts. Interiorly tapering locking rings fit over the correspondingly tapering ends of the blocks to hold the latter together, and are held and adjusted in place by screws.

An improved muff has been patented by Alice Pass, of New York city. The invention consists in making a satchel muff with a gathered satchel opening upon the top, and with hand apertures below, arranged at right angles with the satchel opening. The outside of the muff is provided with a pocket.

Mr. P. A. O'Malley, of Brooklyn, N. Y. has patented a package fastener which facilitates the tying and untying of packages of mail matter and other materials. In this invention a flat plate is provided, to one end of which the tying cord is attached. The face of the plate is provided with fastening pins and a pivoted clamp, the arrangement of the parts being such that in tying a package the plate is laid upon the package, and the cord then passed around it, then under the head of a fastening pin on the plate, then around the package in a contrary direction, the extremity of the cord being then fastened on the plate by means of the pivoted clamp. We are informed that this invention has been used with great satisfaction in the City Delivery Department of the New York Post Office.

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RICHARD'S REGISTERING BAROMETER.

This instrument is provided with a series of superposed vacuum shells or drums, similar to those of aneroid barometers, which are screwed together at their centers. They are each furnished with an internal curved spring to resist the atmospheric pressure. These drums are distended or flattened under this pressure, and their motion is transmitted to a large needle by a very simple system of levers. This needle carries at its extremity a metallic pen of special form, containing a certain quantity of ink whose base is glycerine.

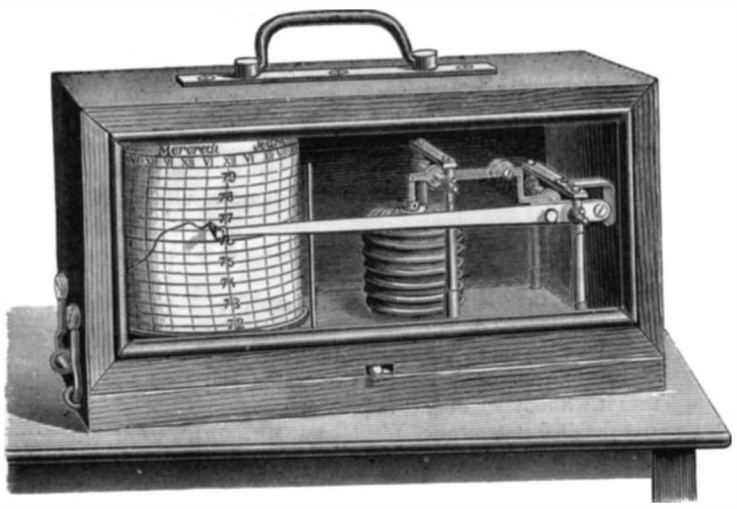
A cylinder carrying a barometric scale revolves in front of the pen, and in light contact with it. The cylinder makes a revolution in a given time, a week in the present instance. The pen is made to rise and descend by the dilatation and contraction of the drums of the barometer, leaving an interrupted tracing upon the paper. In this manner a diagram of barometric height is obtained, the reading of which is rendered easy by the arrangement of the barometric scale.

The rotating motion of the cylinder is obtained in this instrument in an entirely novel manner. The clockwork, instead of being fixed and communicating motion to the cylinder by gearing, is placed inside the cylinder and moves with it, and is revolved by means of a pinion projecting outward; the pinion has an epicycloid movement around a fixed wheel, placed upon the frame of the instrument.

Every week the observer changes the paper upon the cylinder, puts a little ink in the pen, winds up the clock movement, and the apparatus will work for another week without being touched.

The same system is applied to thermometers and hygrometers. The motive power of the pen is the only change that has to be made.

The indications of this instrument are exact, it is convenient to use, the operation of setting it in motion and of changing the paper may be accomplished in a few seconds and without any difficulty, and the pen will record for a month if necessary without being touched.—*Gaston Tissandier, in La Nature.*



REGISTERING BAROMETER.

REVERSIBLE TOOLS.

The engraving shows an improvement in the class of tools in which the bit or working part of the tool is pivoted in a forked handle and has two working ends, either of which may be used by turning it on its pivot in the handle.

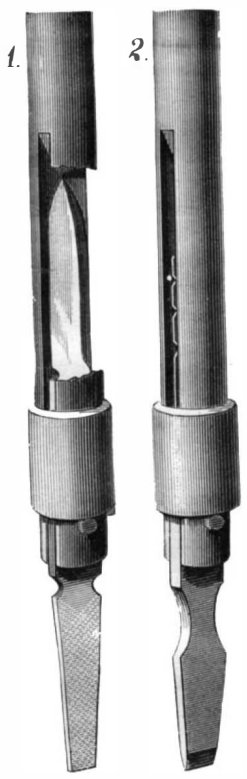


Fig. 1 shows a bit of steel having on one end a penknife and on the other a file. Fig. 2 shows a combined gimlet, bit, and screwdriver. These tools are held in position in the handle by the ferrule. When it is desired to reverse them the ferrule is moved upward on the handle.

This invention has been patented by Mr. W. A. Wales, of Newton, Mass.

Oxygen Gas Works, Paris.

The question of the economical production of oxygen has much occupied the ingenuity of chemists. According to the *Revue Industrielle*, this problem is now in a fair way of being solved. There is at present in Paris an oxygen gas works which is capable of supplying nearly 11,000 cubic feet of oxygen daily. This is, of course, a small beginning; but it is a great advance from the scale of laboratory production to which this gas has long been confined. No details are yet available concerning the process adopted in the manufactory, nor is the lowest selling price stated. The cost is, however, said to be moderate, and capable of reduction if the gas is largely consumed. Our contemporary remarks on the importance of this subject, as a cheap supply of remarkably pure oxygen, such as is said to be that produced at the new establishment, will probably exercise a very considerable influence on the question of lighting as well as on the progress of metallurgy and practical chemistry. The gas as sold in Paris from this first factory on the new system is said to be very cheap, although the works may be considered somewhat as of an experiment. The most important thing about the present announcement is the fact that, under any circumstances, the production of good and cheap oxygen in abundant quantity is established.

Close Writing.

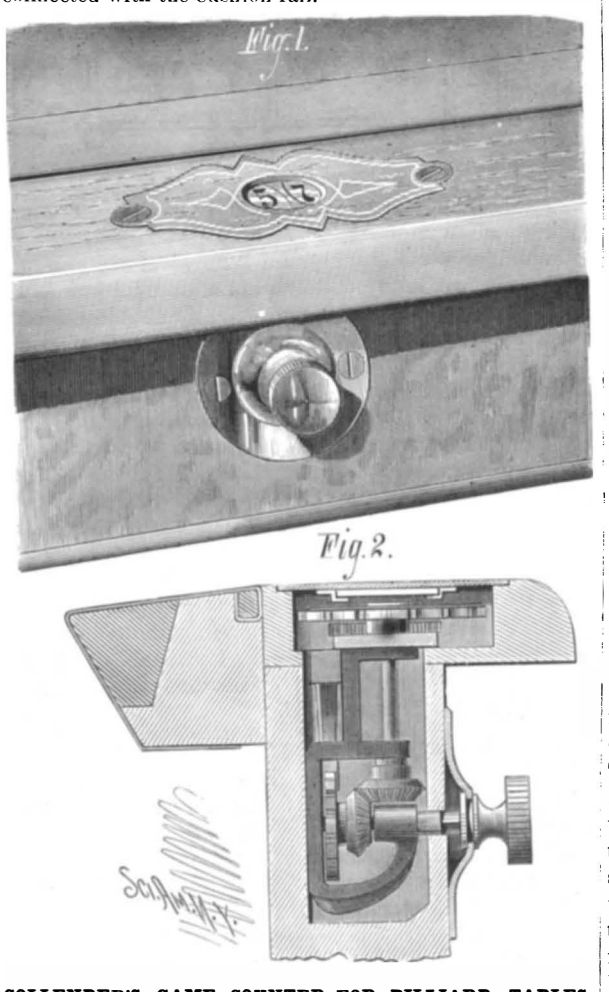
A German having "written" on a postal card an incredible number of words (25,000, we believe) in a style of stenography used in Germany, the author of the system set up the claim that it was superior to any other in use. The claim was disputed by the disciples of Pitman in England, and a prize was offered for the largest number of words written in Pitman's style on an English post card, the writing to be legible to the naked eye. The card of the winner, Mr. G. H. Davidson, is said to have contained 32,363 words, including the whole of Goldsmith's "She Stoops to Conquer," an essay on John Morley, and half of Holcroft's "Road to Ruin." It will be understood that probably not one of all these words was *written*, that is, had all its sounds expressed or even indicated. Such shorthand hints at words, but does not write them.

NEW GAME COUNTER.

The engraving shows a novel game counter which may be let into the top of the cushion rail of a billiard table, and is operated by a knob or handle at the side of the table.

The registering mechanism is much like that used in engine and other speed counters; the units wheel is provided with a single tooth, which, at every revolution, engages the tens wheel and moves it forward one place. The units wheel receives its motion from a vertical spindle, which, in turn, is actuated through miter gearing by a horizontal spindle having at its outer end a milled knob and at its inner end a notched wheel, which is engaged by a detent spring retaining the numbers in the dial aperture in the proper position or bringing them into that position after the hand is removed from the knob.

The apertured plate through which the figures are seen is formed so as to answer as one of the angle sights usually connected with the cushion rail.



COLLENDER'S GAME COUNTER FOR BILLIARD TABLES.

Fig. 1 represents the device in perspective, and Fig. 2 is a vertical section showing internal parts.

This invention was lately patented by Mr. H. W. Collender, the well known billiard table manufacturer of 788 Broadway, New York city.

The Longest Span of Wire.

The longest span of telegraph wire in the world is stretched across the Kistnah River from hill to hill, each hill being 1,200 feet high, between Bezorah and Sectanagrum, in India. The span is a little over 6,000 feet in length. The only mechanical contrivance used in stretching this cable across the river was a common windlass.

ENGINEERING INVENTIONS.

An improved car coupling has been patented by Mr. Thomas Noble, of Todd's Point, Ill. This invention relates to that class of couplers that are self-couplers; and it consists of a coupling link having a rack prolongation which is entered into the draw head and operated by a pinion, and of a swinging coupling pin operated in a vertical plane by a lever, wheel, or other suitable device.

An improvement in that class of steam vacuum pumps called "pulsometers," which are operated by steam pressure brought directly upon the liquid as the forcing element, while the subsequent condensation of the steam furnishes the lifting power to supply the pump, has been patented by Mr. Gardiner F. Badger, of East Orange, N. J. The invention consists of an improved valve seat designed for the induction and eduction water ways, and of improved devices for holding the valve seats and valve guards in place.

An improved car axle box has been patented by Mr. William G. Raoul, of Macon, Ga. The object of this invention is to provide an axle box for car journals of such design and arrangement as to dispense with the use of the wedge or key heretofore used over the journal brass, and to dispense with the button or collar heretofore used on the ends of the axle to receive the end thrust, and to provide the axle box with a close fitting lid or cover that can be opened and closed easily and quickly.

An improved furnace for locomotive and other steam boilers has been patented by Mr. John Alves, of Dunedin, New Zealand. The grate bars are set out from the tube sheet to leave an air passage between them, and a fire bridge is supported by the grate bars, and is provided with a vertical and inclined and horizontal slots and flange surmounting the air chamber.

An improved dumping scow, which can be dumped very easily, and will float well, has been patented by Mr. Francis Pidgeon, of Saugerties, N. Y. The invention consists in a dumping scow formed of two independent floats, which are connected by means of chains or ropes which pass from the bottom edge of the longitudinal side of one float to the bottom edge of the corresponding opposite side of the other float, which chains or ropes are attached to a windlass, by which the floats can be united or separated, as may be desired.

CANE WITH TOILET COMBINATION.

The annexed engraving represents a very handy combination of comb, brush, and mirror, with a hollow-headed cane intended especially for travelers' use. The comb and brush are confined in the tubular head of the cane by a screw cap in which is placed a convex mirror.

This invention was lately patented by Mr. Richard Lamb, of Norfolk, Va.

The Adirondack Survey.

Shortly before the ice broke up on Lake Champlain, the Superintendent of the Adirondack Survey completed a task in civil engineering which will rank among the most important and interesting feats of the kind ever performed in this country. A number of long lines have been run from the western shore of Lake Champlain back into the wilderness, some of them more than a hundred miles long, and involving several thousand stations. Two of these run from Mount Marcy to points on the lake at Westport and Ticonderoga, and it being found desirable to connect and compare them while the lake was frozen, arrangements were made to have observations taken at the water level at ten stations along the lake on the same day. The work was successfully accomplished, and a line of stations for levels was secured from Whitehall, 126 miles northward, observations being taken at Whitehall, Ticonderoga (Mount Defiance), Crown Point Landing, Port Henry, Westport, Willsboro, Port Kent, Plattsburg, Rouse's Point, and Fort Montgomery.

The Siamese Twins Outdone.

An Italian couple, Tocci by name, are at present exhibiting at Vienna a most remarkable specimen of their progeny, a pair of twins named Jacob and Baptiste. These boys are grown together from the sixth rib downward, have but one abdomen and two feet. The upper part of the body is completely developed in each; their intellectual faculties are of a normal character. Each child thinks, speaks, sleeps, eats, and drinks independently of the other. This independence goes so far as to admit of an indisposition of the one without in the least affecting the other. They are over three years old, in perfect health, and seemingly in excellent spirits.

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The Annual Fire Loss.

During the past five years the United States and Canada have burned up, in 55,775 fires, property to the value of $405,269,700, the loss for 1877 footing up $100,000,000 nearly. The New York (insurance) *Chronicle*, which gives these figures, finds that the fires of 1880 were distributed as follows:

States and Territories.	Total Losses.	States and Territories.	Total Losses.
Alabama	$708,600	Montana	$34,500
Arizona	38,500	Nebraska	617,200
Arkansas	326,400	Nevada	394,200
California	2,841,200	North Carolina	1,089,300
Colorado	741,100	New Hampshire	773,100
Connecticut	1,374,300	New Jersey	2,605,400
Dakota Territory	102,400	New York	12,751,000
Delaware	372,600	Ohio	3 529,000
District of Columbia	72,600	Oregon	435,500
Florida	471,800	Pennsylvania	7,714,400
Georgia	321,100	Rhode Island	420,100
Illinois	3,912,400	South Carolina	1,232,300
Indiana	2,400,000	Tennessee	467,600
Indian Territory	19,000	Texas	1,337,600
Iowa	1,186,100	Utah	67,000
Kansas	658,000	Vermont	651,400
Kentucky	1,197,600	Virginia	1,238,100
Louisiana	874,800	Washington Territory	160,600
Maine	1,784,900	West Virginia	271,100
Maryland	1,065,800	Wisconsin	1,558,900
Massachusetts	4,890,100	Wyoming Territory	9,400
Michigan	2,348,000	Canada	5,194,600
Minnesota	2,872,800		
Mississippi	245,800	Total	$79,838,000
Missouri	3,190,800		

In round numbers the fire tax last year, in property destroyed, was $80,000,000, a very large portion of the loss being chargeable to our neglect of simple and obvious means of making houses less combustible. It would appear from the insurance statistics that liquor stores are most apt to burn, and groceries and hotels follow closely after, there being twice as many fires in these classes of buildings as in sawmills and drugstores, which come next in the list. It would be interesting to know the relative percentages of fires in different sorts of houses calculated on a numerical basis. The more hazardous classes of buildings, with the number of fires in each during the past five years, are given in the following table:

Groceries	2,281	Tanneries	225
Hotels	2,198	Vessels in port	240
Liquor stores	2,315	Photo galleries	235
Sawmills	1,098	Paint shops	222
Drugstores	1,019	Meat markets	218
Livery stables	858	Feed stores	213
Restaurants	820	Woolen mills	202
Flour mills	635	Confectioneries	204
Furniture factories	585	Shingle mills	180
Gin houses	614	Breweries	183
Carpenter shops	489	Cigar factories	168
Carriage factories	464	Grain elevators	171
Churches	434	Sash and blind factories	166
Blacksmith shops	468	Harness factories	158
Bakeries	462	Butchers' shops	141
Planing mills	448	Fancy notion stores	145
Lumber yards	381	Tobacco barns	149
Grist mills	341	Oil refineries	140
Iron foundries	315	Cotton mills	135
Ice houses	309	Grain warehouses	131
Railroad depots	308	Paper mills	137
School houses	304	Box factories	132
Oil derricks	300	Billiard saloons	127
Newspaper offices	262	Agricultural implement factories	120
Cooper shops	260	Slaughter houses	115
Machine shops	291	Tobacco factories	112
Public halls	256	Theaters	74
Printingoffices	252	Meat Packers	86
Shoe factories	255		

The Fish Supply of New York.

The following statement, compiled by G. M. Lamphear, was read at the recent meeting of the American Fish Culturists' Association in this city. It shows the amount of the various kinds of fish received in the wholesale markets of New York for ten months from March 1, 1880, to January 1, 1881:

	Pounds.		Pounds.
Flounders	1,186,469	Pickerel and pike	516,317
Halibut	2,311,742	Yellow pike	151,001
Cod	5,269.607	Cisco	435,988
Pollock	611,295	Whitefish	872,144
Haddock	1,643,554	Brook trout	5,995
Frostfish or tomcod	58,831	Salmon trout	35,720
Blackfish	184,171	Catfish	36,267
Mackerel	3,236,197	Small fresh water fish	394,358
Spanish mackerel	346,678	Terrapin	1,219
Weakfish	1,213,141	Green turtle	2,494
Kingfish	10,732	Lobsters	1,311,981
Sheepshead	55.586	Scallops.....Gallons,	29,499
Porgies	1,565.836	Turbot	86
Sea bass	284,602	Redfish	22,854
Striped bass	478,716	Perch	143,332
Bluefish	4,284,613	Buffalo fish	3,398
Smelt	575,005	Pompano	1,768
Salmon	150,642	Swordfish	1,285
Shad.....Counts,	923,474	Small salt water fish	393,325
Herring "	463,884	Mullet	11,658
Eels	993,248	Bonita	67,231
Sturgeon	46,170		
Black bass	36,943	Total	25,605,524

Needles by Heredity.

All sorts of physical and moral (sometimes immoral) traits have been charged to heredity. The problem of inheritance *in utero* now includes needles. The Louisville *Courier Journal* gravely tells of the wanderings of a needle which entered a young lady's foot nine years ago, and lately made its appearance in the thigh of her year-old baby. The needle was much corroded.

The Solar Parallax.

In a recent communication to the French Academy M. Faye tabulates the results obtained by different methods of determining the sun's mean parallax, as follows:

Geometrical methods. 8·82″.	8·85	by Mars (Cassini's method) ..... Newcomb.
	8·79	by Venus, 1769 (Halley's method)..Powalky.
	8·81	by Venus, 1874 (Halley's method)..Tupman.
	8·87	by Flora (Galle's method) .....Galle.
	8·79	by Juno (Galle's method) .....Lindsay.
Mechanical methods, 8·83″	8·81	by the lunar inequality (Laplace's method)..... —
	8·85	by the monthly equation of the earth .....Leverrier.
	8·83	by the perturbations of Venus and Mars .....Leverrier.
Physical methods, 8.81″.	8·799	Velocity of light (Fizeau's method .....Cornu.
	8·813	Velocity of light (Foucault's method).....Michelson.

Touching the relative accuracy of these results M. Faye concludes:

1. That the method of the physicists is superior to all others, and ought to be substituted.

2. That the value of solar parallax, $8\frac{8}{18}''$ (by physical methods), is now determined to about $\frac{1}{100}$ of a second.

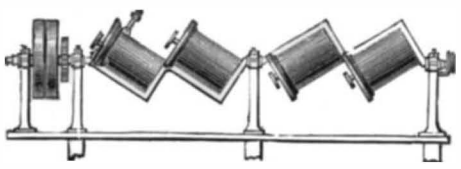
3. That the seven astronomical methods of procedure converge more and more toward that value, and tend to confirm it without equaling it in precision.

A detailed statement of Lieutenant Michelson's work will be found in his paper published in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 193.

Testing Broken Stone.

The *Bulletin du Ministère des Travaux Publics* describes in its current number a series of investigations conducted by the French Administration for ascertaining the resisting power of different classes of broken stone employed in the formation and maintenance of roads. These experiments were directed toward two objects; to ascertain the resistance of different classes of stone to wear and to shock; and their resistance to crushing. With regard to the first a standard of comparison is employed, and the stone is submitted to treatment in a testing machine of the form shown in the annexed sketch.

This machine consists of two groups of four cylinders each, mounted side by side on a bent frame, which terminates in horizontal shafts, at one end of which on one group are mounted pulleys and gearing for transmitting motion to the other group. The axial distance apart of these shafts is 16 inches, and the cylinders are about 7¾ inches in diameter and 14 inches long. In one of these chambers is placed a standard sample of porphyry, and in the other the stone to



be tested; the charge averages about 11 pounds. The machine is driven with a speed of about 2,000 revolutions an hour, and the stones are subjected to attrition, and also to a to-and-fro movement from end to end of the cylinder. After about five hours the cylinders are emptied and their contents are carefully washed, the fragments precipitated being divided by sifting into three classes—those which will not pass through openings 0·39 inch in diameter, those decreasing from this size to 0·07 inch, and the dust smaller than 0·07 inch. The first portion is returned to the stone being tested, and the third is weighed, the relation it bears to the original charge indicating the value of the material tested. Experiments showed that the best samples yielded 2 per cent of their weight in dust, and for this class of stone a coefficient of 20 was adopted. The compression tests were obtained by submitting cubes 1 inch square to the action of a hydraulic press. The best specimens rarely showed a resistance of more than 20 tons per square inch, and a coefficient of 20 was also adopted for stones of this quality. Altogether 637 samples of stone were tested.

Metallic Cars.

An enthusiastic writer in a Western journal calls attention to the urgent need of fireproof passenger cars, and expresses surprise that some of our enterprising iron and steel manufacturers have not already furnished the railroads with a model car of this description. He says that cars can be made of steel tubes and plates with the greatest facility, and that they would be stronger, lighter, and safer than the present wooden cars, with many incidental advantages in the way of heating, lighting, etc.

The question of employing steel and iron as material for the construction of freight and passenger car bodies is not a new one. There was quite a stir made about it a few years ago. It was not only discussed very generally in the newspapers and technical journals, but quite a large number of freight cars were actually built in order to test the different theories as to how these materials should be used for car bodies to the best advantage. These included box, gondola, and refrigerator cars, the floor and body framing of which consisted of iron tubing and iron and steel rods, held in position by bands and tie blocks, the outside being covered with sheet iron, and the inside sheathed with wood. Another form of construction consisted of channel iron I beams for floor frame, and heavy wrought iron bars for the super structure. The cars were from 30 to 34 feet in length, and weighed from 22,000 to 25,000 pounds. What kind of record these cars have made we are unable to say, but the inference is that it is not a very encouraging one, or it would by this time have been spread before the world. There has doubtless been some progress made as compared with the ruder constructions of an earlier period, but this improvement, so far as we can learn, has not been so much in diminished weight and greater proportionate carrying capacity as in a better constructive use of the material. It must, we think, be admitted that the results thus far are not such as to make metallic freight car bodies popular, and until they shall begin to supersede wood in this class of rolling stock there is not much chance for metallic passenger cars.

It is a common remark, even among railroad men, that iron or steel cars will some time or other come into general use, for the reasons that timber is getting scarce and more expensive, and that iron is already extensively used for truck frames and body bolsters. But the question of iron body construction does not depend upon the way in which trucks are built. The two are essentially unlike, and are subject to different conditions. It does not necessarily follow that because iron makes a good axle or crowbar, it will also make an equally good flagstaff or ax handle. Railroad cars, as compared with stationary structures, are subject to peculiar conditions inseparable from the uses they perform. These are rapid movement, a minimum of weight, liability to violent concussion, and the necessity of being easily and readily repaired. With respect to these, wood has the advantage over iron at the start. It is lighter, more compressible, will resist shocks better, and, in case of breakage, repairs can be made with less difficulty. Iron, it is true, will not splinter nor burn; a car made of it may not weigh more than a wooden one of the same size and capacity; it may last longer, resist shocks quite as well if rightly constructed, be worth more as scrap when worn out, and be repaired with less difficulty than is generally supposed. These arguments, however, amount to little so long as they are not sustained by a record of performance.

It would be no very difficult thing, as it strikes us, to make a model passenger car body entirely of iron or steel—frame, panels, roof, flooring, and seat frames, with no inside wood finish even. It could be beautifully ornamented inside and out with paint and varnish, and made to look very light, cheerful, and attractive. It would make a few beautiful "runs," and after a few rose-colored local notices in the papers would be lost sight of and forgotten, and the roads would go on ordering new wooden cars as before, without the least regard to the wonders performed by the model car in the way of somersaults down embankments, with no roasting or scalding of passengers as an accompaniment.

One great obstacle in the way of iron body construction is the fact that it can not be carried on without special shops, machinery, tools, and workmen. A new and distinct department would be necessary upon every road using, repairing, or building such cars. Machinery and tools for the purpose would have to be perfected by degrees, according to the methods of construction that experience should prove to be best. Wood working machinery, on the other hand, is already perfect, or nearly so, and car builders know just what kinds to put into a shop.

Another obstacle is the tendency to make iron construction conform to that of wood, when the difference in the two materials seems to require that the construction should also be essentially different for each. Our freight cars are designed almost exactly upon the same principles as our passenger cars, and with special reference to wood construction. It is manifest, however, that if iron cars are ever to be a success, the material must be used constructively *as* iron, and without reference to the peculiarities of wood construction. The design for a model iron passenger car that would really be a model for imitation would involve such a wide departure from present practice in order to meet the requirements of the new material that a first attempt could hardly be a success except by a miracle.

Meanwhile, railway passengers must rely mainly upon safety stoves and safety lamps in cases of collisions and overturns. An ordinary passenger car, with only a narrow door at each end for exit, allowing only one person to pass out at a time, is a regular trap whenever panic stricken occupants want to get out in a hurry. The material of the inside finish is also so extremely combustible that only a spark is necessary to set it in a blaze. The ends of the car are almost sure to be fired first, thus cutting off access to the doors. In shops and other buildings means are provided for extinguishing fires when they first break out, but no such means are at hand in the case of cars, unless from pure accident. The need of iron as a material of construction, or of some means by which wood may be rendered less combustible, is very great in respect to cars. But we do not expect any immediate revolution in the construction or warming of cars in order to secure greater safety. The mass of people seem to like things pretty well as they are, and will stick to the stoves, good, bad, and indifferent, and to the varnished and painted cabinet woods a while longer.—*National Car Builder.*

MISSISSIPPI SANITARY COUNCIL.—The third annual meeting of the Sanitary Council of the Mississippi Valley will begin at Evansville, Ind., April 20. Questions relating to quarantine and the transportation of contagion will be the chief subjects of discussion.

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An Outfit for Mining Machinery.

A complete plant for mill and leaching works for the Rosario Mining Company, Mexico, was lately shipped by Parke & Lacy, of San Francisco, Cal., the engines, batteries, and, in fact, all the iron work having been made there by Prescott, Scott & Co of the Union Iron Works. The mill is a forty-stamp one, but so arranged and with sufficient power to be increased to eighty stamps. The whole reduction works, when ready to run, will have cost $150,000. The mines being about 100 miles from the sea coast, the contractors had made to order ten sixteen-mule wagons, with harness and all necessary appliances for handling the machinery. The engine frame weighing 11,000 pounds, a special wagon was made for it, and special wagons with saddles were made to take the two steel boilers, which weigh 7,500 pounds each.

As this outfit is exceptionally complete and expensive, the *Bulletin*, of San Francisco, has taken pains to obtain the following details with regard to the construction of the leaching works and other machinery, as well as of the processes to be employed in them.

The ore when delivered to the mill is first dried in the improved Stetefeldt drier. As soon as the ore is dried it falls into cars and is taken to the Eclipse feeders at the batteries. Two large dust chambers are arranged above the batteries, provided with sheet iron hoppers, and are connected with a Sturtevant exhaust fan, which draws the dust into them, where it is deposited at the bottom of the sheet-iron hopper.

From the battery the pulp is taken by screw conveyors and an elevator, first, into a hopper provided with a sifter or revolving screen, where coarse particles are sifted out and returned to the battery. The hopper is provided with a Standish feeder by which the pulp is discharged into the conveyor and elevator, which takes it to the Stetefeldt furnace. This furnace is of the largest size, with a shaft 6 feet square and 43 feet high, and a system of twelve dust chambers.

The building to cover the furnace, dust chamber, and cooling floor will be 46 feet wide and 102 feet long. The furnace will be built in the most substantial style, with a great many improvements in construction, which are the result of the experience at the Ontaro mill, Utah. It is calculated to roast from forty to fifty tons of ore.

The ore, after cooling, is taken to the leaching house in cars. The leaching house will be 104 x 38 feet. There are eight leaching tanks, of 12 feet in diameter, and the necessary tanks for precipitating and for the solutions. For the conveyance of the solutions back to the upper tank again for reuse, a novel method is employed, the usual pumping system being dispensed with. Below all the leaching tanks and vat is a tank connected with an air compressor, the pressure of air driving the liquid to the upper vat or reservoir. For the drying of the silver precipitate a centrifugal machine will be used.

The roasted precipitate will be melted in a reverberatory furnace with charcoal gas fire, this furnace being constructed with a peculiar removable hearth, so that the hearth can be readily repaired if it becomes injured by the matter which results from the melting of the bullion.

The plans for the furnace, drying kilns, leaching tanks, etc., were all made by C. A. Stetefeldt, and the position of the batteries and engines had to conform to these more or less.

The engine, which is now set up at the Union Iron Works, where it may be seen, is of the most improved design, having a box frame and being compact and neat in design. It is a 24 x 60 inch. The eccentric rods, valve rods, and cut-off rods all have first-class bronze for journals, thus giving a better bearing surface, with no liability to heat. The fly-wheel is 18 feet in diameter, and weighs 30,000 pounds. The main pulley is 16 feet in diameter, 43 inch face, and is made in eight separate pieces bolted together. The valves are made of bronze, and all the working parts of the cut-off are steel, and every nut used in construction is case hardened. The engine is fitted with Phillips' improved metallic packing. The valve motion and cut-off is that invented by Eugene O'Neill, chief draughtsman at the Union Iron Works.

There are also two 9 x 13 Eclipse ore crushers, eight swivel dump cars, and a No. 5 Knowles pump.

There is one pair of 54-inch diameter steel boilers, 16 feet long, with 46 tubes, 3½ inch, and with double steam drums, 40 inches in diameter and 12½ feet long. The stack will be 42 inches in diameter and 80 feet long. The Crosby steam gauge, water gauge, revolution register, locomotive clock, and the Edson time recording and alarm gauge will be set up in a handsome case in front of the engine. A set of tools, tube scrapers, extra shoes and dies, and a lot of miscellaneous articles, not procurable in Mexico, go with the plant.

Among other improvements forming part of this machinery is the feed water heater, which was devised at the Union Iron Works recently. It is 30 inches in diameter, 9 feet 8 inches high, and has 157 square feet of heating surface.

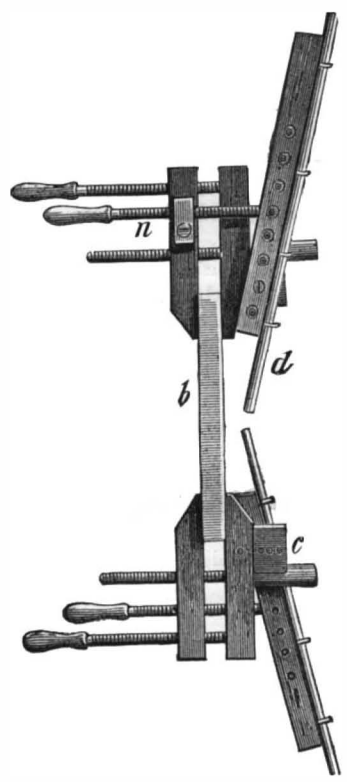
The mines of the Rosario Mining Company are located in the Rosario Mountain, a spur of the Sierra Madre, a distance of one hundred miles from the port of Ajiavampo, on the Gulf of California. The Rosario mines were discovered in 1852. They consist of a group of nine mines, under the following names: Dulces Nombres, San Jose, Bueno Fe, Carmen, San Genovera, Providencia, San Rafael, Sonorense, and Discubridora. They are on one vein, and together embrace a distance of 9,600 feet. The vein is 4,000 feet above sea level.

A MECHANICAL FINGER FOR USE IN THE PHOTOGRAPHING OF ENGRAVINGS.

Occasions frequently arise when it is necessary to have reproduced in *facsimile*, or to any determined scale, printed matter or engravings bound up in a large and thick volume. In order that the photographer to whom such work is intrusted may be enabled to accomplish it successfully, it is indispensable that the special page being operated upon be held in a firm and flat position in front of the camera. In the case of loose engravings or unbound sheets no difficulty is experienced; but when these form part of a book which is thick, heavy, and somewhat rigidly bound, then arises the difficulty of complying with the first condition in reproduction by aid of photography, viz., a position of flatness, rigidity, and rectangularity to the axis of the lens, by which it is to be reproduced.

At the last meeting of the Photographic Section of the American Institute Mr. Oscar G. Mason, of Bellevue Hospital, submitted for the examination of the members a piece of apparatus he had devised for this purpose, and which in practice he had found to answer in a most effective manner. He designated it "the photographer's compressor or mechanical finger," on account of the firmness with which it could be made to hold anything presented to it for the purpose of being copied, whether that were an anatomical or physiological preparation, or, as in the case now before us, a page in a bound volume.

To construct the mechanical finger or fingers—for two are required in most cases—is an operation within range of the powers of every one possessing even a modicum of mechanical ability. Three pairs of small cabinetmaker's handscrews are necessary. The size of those that will prove most useful for ordinary gallery work is that known in the tool stores as



"eight-inch handscrews." One of the three pairs is taken asunder, and each jaw sawed across in such a manner as to leave the threaded ends to form nuts for the lever screws of the two completed "fingers." The piece so removed by the saw should be left long enough to admit of being held in position on the lower jaw of the "finger" by a strong screw through one end, while the short end of the nut—which in small handscrews is usually too short for a second hole—may be held in position by a short dowel pin of one-eighth inch wire. This nut, as fixed in its place, is shown at *n* in the accompanying diagram, in which the whole arrangement is represented.

In this diagram *b* represents an edge view of the board upon which the volume is to be fixed while being photographed. Upon the upper jaw of the handscrew portion of the finger is firmly screwed a block, *c*, through which several holes are bored in a straight line, to admit of raising or lowering the fulcrum point of the finger to suit the thickness of the book or whatever other object is to be held in position. These, however, are very seldom required, as the lever motion is such as to accommodate the point of the finger for all thicknesses up to two inches. To this block, *c*, is attached by a strong screw or loose pin the finger box or lever, along the upper surface of which is a row of ordinary screw-eyes as used for the suspending cord of picture frames. Through this row of the "eyes," four of which is a sufficient number, is run a small rod of hard wood of such thickness as to slide easily, although not too loosely, through the screw-eyes, so as to admit of its being pushed out or withdrawn to the proper part of the book on which it is desired to make it bear. This point is then depressed to any desired degree by the action of the supplementary screw, attached as before described and as shown in the diagram. The finger rods of the apparatus exhibited at the meeting of the Institute were formed of round dowel pin wood of three eighths inch thickness.

When the book is large and heavy, to prevent the rod from making an indentation by its pressure, slips of stiff wood the length of the page are laid along the opposite margins, and upon these the full pressure of the finger is brought to bear. The board itself may be of any dimensions to suit the class of work for which it is required, from a pocket volume up to a large plan or map.

The numerous practical photographers who were present when this piece of apparatus was exhibited and described welcomed it as supplying a want that had long been felt, and that welcome was none the less cordial from the conviction that each of them could construct it for himself at a small cost. The board itself may be sustained in a vertical position on any convenient stand, or it may be suspended on the wall. When used by Mr. Mason in Bellevue Hospital it is erected on the adjusting rod of an ordinary head rest.

A New Type of Embroidery.

The attention which has been drawn to the novel style of embroidery, exhibited first in Boston and now in New York, by Mrs. Oliver Wendell Holmes, Jr., of the former city, would seem to be justified by the originality, boldness, and artistic promise of the work. The effects are produced by combining filoselle, worsted, silk, and cotton thread on a ground of satin. There is no regularity of stitch, no parallelisms of threads, no inclinations of an exact series of darnings, none of the usual formal methods in embroidery; yet the effects are striking and pleasing. There may be something of haphazard, hit-or-miss, about the work, says the art critic of a morning paper, still the effect is impressive, if not startling. "It is, in fact, the vigor of the work which gives the pleasure. Here is one striking piece, perhaps the best: On a dark blue silk ground, imitative of an evening sky, there stands out in the foreground the gnarled limbs of a New England fir tree. Dark masses of foliage, made by the thick laying on of masses of worsted, indicate the irregular growth. The sheen of the moon on the water is expressed by silvery lines of white thread, and off in the distance is the red lamp of some lighthouse. These are the conceptions of an impressionist, only instead of the facile brush and paint there is substituted for them needle and thread. Here are fields all aglow with the autumn weeds, where the golden russets form a rich, warm mass of color. Here is quite the opposite: A storm, a blizzard, with the stinging snow, expressed by driving lines of white thread. It is all realistic, with some little of a Japanese method, for there are water pieces with tumbling waves that look almost as if they had been made at Yokohama. Some of these embroideries shock just a little by the effects of the cold, clear skies, produced by the hard silk backings, for there may be criticism, for the work itself enters from its cleverness quite into the domain of art. Perhaps this new method of expressing things with a needle is only tentative so far, for other effects might be more happily produced by taking a softer worsted back, and not the hard silk background. Mrs. Holmes has certainly produced most novel effects, quite incomprehensible to masculine minds when the methods are understood. One would suppose, however, that no tyro could ever produce this kind of work, for the requirements to make such embroideries would be a keen eye for form, outline, and a very perfect appreciation of color and contrast. Of the originality of the work, even of the pleasant impressions derived from Mrs. Holmes' embroideries, there can be no doubt."

Buggy Beans.

Recently several cases of sickness occurred in Kingston, N. Y., it was supposed, by eating diseased pork. Specimens of the pork were sent to Dr. George F. Shrady, of this city, for examination, at the request of Dr. E. H. Loughran, Health Officer, Kingston. Dr. Shrady reported that he could discover no evidence of disease in the pork, and that it was entirely free from trichinæ. All of the persons who were made sick, as supposed, by the pork, also ate heartily of beans, the dish being baked pork and beans. After the report of Dr. Shrady the subject was allowed to rest, as the sick persons all recovered, though for a time it was feared that several of them would die. It was afterwards discovered that the trouble was caused by the beans, they being infested with small black insects. The bean which is thus infested presents on its surface a faint, black spot, underneath which one or more of the insects may be found. Persons who have eaten heartily of such beans have been taken violently sick with vomiting, accompanied by general weakness and prostration, which continues for a few days only.

James Tennant.

Professor James Tennant, F.G S., of King's College, London, one of the best known of British mineralogists, died February 23, having just completed his seventy-third year. His celebrity as a mineralogist was universal, and his special acquaintance with gems secured him the honor of recutting the famous Koh-i-noor diamond for Her Majesty, and the permanent appointment of Mineralogist to the Queen. Professor Tennant was the teacher of most of the eminent geologists and mineralogists of to-day, and was the author of several valuable works is his department of science. Among his writings are: "Catalogue of Fossils Found in the British Isles," "Art Gems and Precious Stones," a "Description of the Imperial State Crown Preserved in the Jewel House of the Tower of London," "Iceland Spars," and a "Stratigraphical List of British Fossils," with remarks on their character and localities. He was likewise joint compile with Professors Ansted and Mitchell of the "Treatise on Geology, Mineralogy, and Crystallography," published in 1857 in Orr's "Circle of the Sciences."

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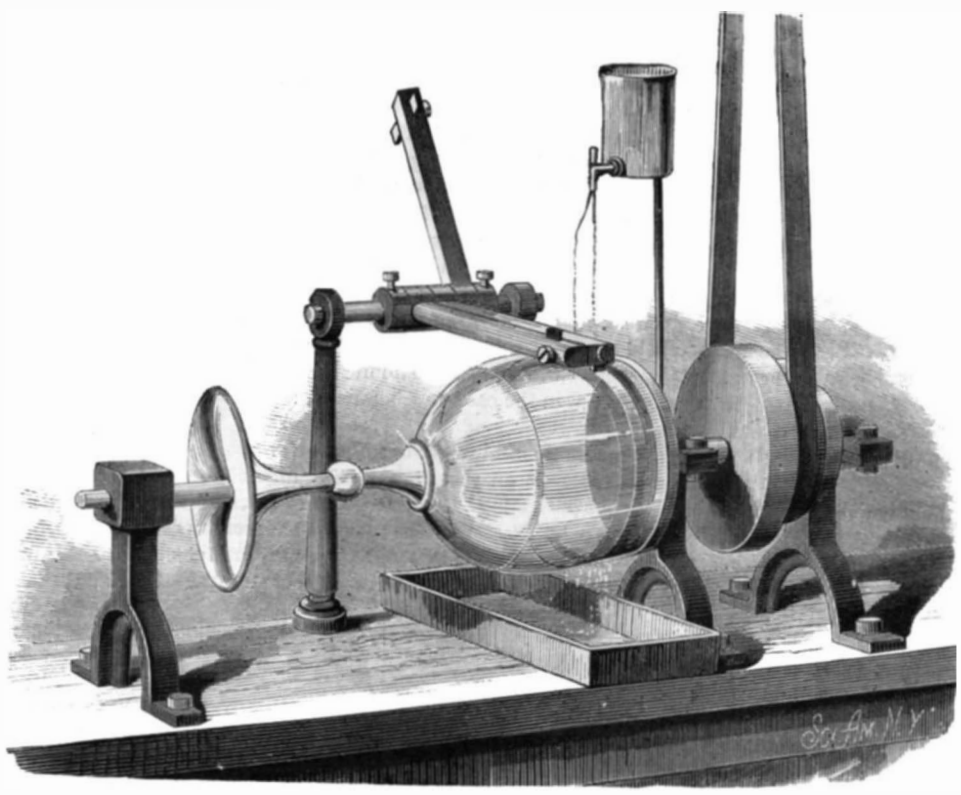
MACHINE FOR GRINDING BANDS ON GOBLETS.

The engraving shows a very simple and effective device for grinding bands on the surfaces of goblets, wineglasses, and other glass vessels of circular form. It will be understood by a glance at the illustration without a great deal of explanation. The larger end of the goblet is carried by a slightly conical chuck revolving on the lathe mandrel. The bottom of the goblet is supported by a tail spindle pressed outward by a spiral spring. A rod, supported by two posts, carries three or more arms having mortises in their free ends for receiving grinding pencils of copper or other suitable metal which are pressed on the glass by the weight of the arms. The pencils are supplied with emery and water or other abrading material, and as the goblet revolves circumferential lines are very quickly formed on the glass. The distance of the lines apart is regulated by moving the arms and fixing them in position on the pivotal rod by means of movable collars fastened to set screws.

This machine was recently patented by Mr. J. B. Higbee, of Pittsburg, Pa.



MACHINE FOR GRINDING BANDS ON GOBLETS.

A Botanist in the Field.

It is announced that the very capable field botanist, Mr. C. G. Pringle, of Charlotte, Vt., has been selected by Prof. Sargent, of Harvard University, to make a tour for botanical exploration and collection during the next one or two years through New Mexico, Arizona, California, Oregon, etc. In addition to work in the forestry department of the census, in which Mr. Pringle has been engaged the past year, and the study and observation in their living state of certain critical genera of plants, Mr. Pringle is to superintend the collection, for the new American Museum of Natural History, New York, of specimens (including trunk sections, flowers, leaves, fruits, etc., as well as the principal commercial and economic products of each) of the more important species of trees found in the regions which he is to visit. Mr. James Kelly is to accompany him as principal assistant.

BURSTING OF FLY-WHEELS.

BY GEO. M. HOPKINS.

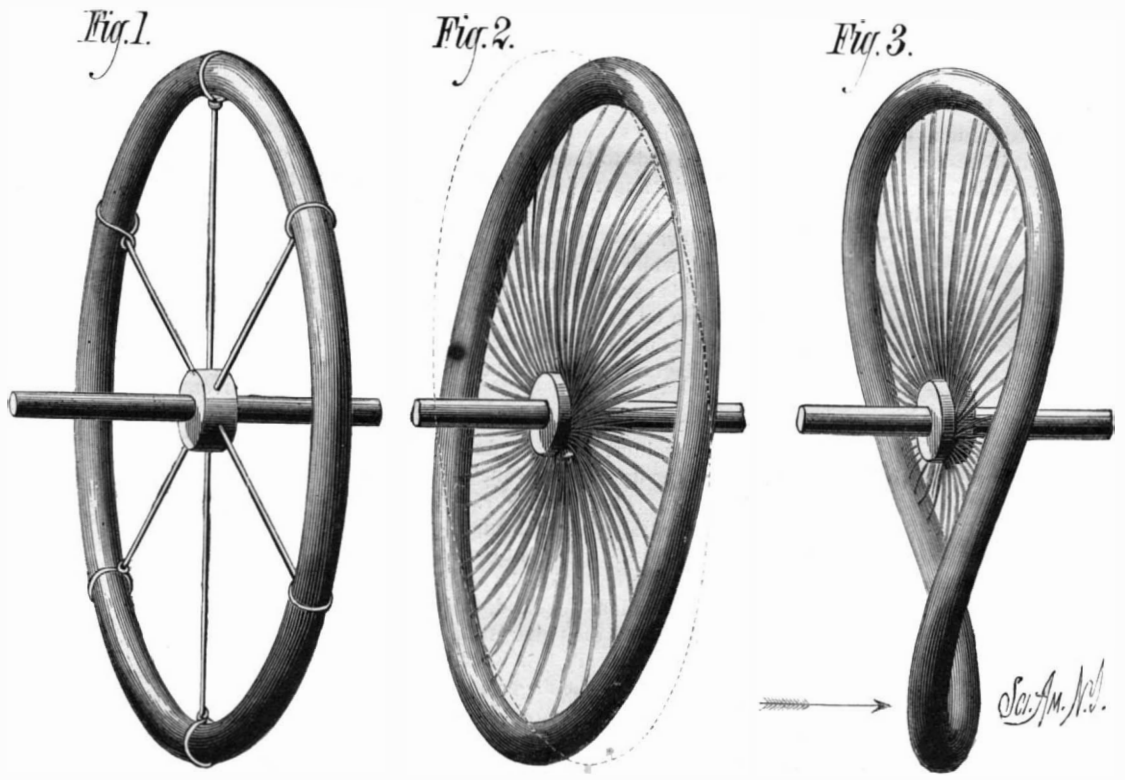
The theory of the bursting of fly-wheels, which has been accepted in the majority of cases, is that the centrifugal force due to a high velocity overcomes the cohesive force of the particles of the material of which the wheel is composed.

Of course this explanation is entirely inadequate when applied to a wheel whose strength is sufficient to resist any tendency to fly to pieces from purely centrifugal action under the conditions of its use; but of the fact that such wheels burst no evidence is needed, and some cause other than centrifugal force must be assigned for the bursting.

Supposing the fly-wheel to be perfectly balanced and without defects in material or design, it may be driven without danger at any velocity usually considered within the limit of safety, so long as it continues to rotate in a plane at right angles to its geometrical axis. And it may be moved in the plane of its rotation or at right angles to it, that is, in the direction of the length of the shaft, without creating any more internal disturbance than would result from moving it in the same way while at rest. But when a force tending to produce rotation at right angles to the plane of the wheel's rotation is applied, the effect will be vastly different, and the result will be a tendency to rotate about a new axis between the other two, and the centrifugal strain upon the wheel is supplemented by a twisting strain, which is an important and generally unnoticed factor in the destructive action.

To bring this idea to a practical application, the shaft and fly wheel of a high speed engine may be taken as an example Let the wheel be correctly designed, well made, and well balanced, and if its shaft is properly lined and supported in rigid journal boxes, the wheel will perform its office without danger of bursting; but support the same wheel and shaft upon weak plummer blocks, and allow one or both of its journals to move laterally at every stroke of the engine, or even less frequently, and a disturbing element will have been introduced which will strain the wheel laterally, and which, together with centrifugal force, will effect molecular changes in the structure of the iron, and the result will be that if the wheel is not immediately broken it finally becomes weakened, so that it will yield to the forces that tend to destroy it.

Any wheel whose axis is swung in a plane at right angles to its plane of rotation, either occasionally and irregularly or frequently and regularly, tends to turn laterally on an axis between that of the normal rotation and that of the extraneous disturbing force. This tendency exists in ordinary wheels, although not visible. The engraving shows a flexible wheel, which clearly exhibits the effects of these disturbing forces. The rim is of rubber, the spokes of spring wire, and when the wheel is revolved very rapidly and moved in a plane parallel with its plane of rotation, no disturbance results, and no effect is produced by moving it at right angles to its plane of rotation; but when the wheel is turned even slightly on an axis at right angles to its geometrical axis by swinging the shaft laterally, the rim, while preserving its circular form, inclines to the plane of the rotation of its shaft, bending the spokes into a concave form on one side of the hub and convex on the other,



FLEXIBLE FLY-WHEEL.

showing the effects of the disturbing force on the figure of the wheel, as in Fig. 2.

When the disturbing force is rhythmical the wheel sets up lateral vibrations and wave motions in the rim, which are out of all proportion to the extraneous force applied.

From this experiment it is evident that the lateral swinging of the shaft of a fly-wheel (for instance when its journal boxes are loose, or when the frame of the machine of which the fly-wheel forms a part is yielding) tends to weaken the wheel even when the lateral movement is slight; and where it is great, as when the shaft is broken, the twisting effect is correspondingly great, and the wheel or its support must yield.

No rotating machines are more subject to bursting than grindstones, and generally no rotating bodies of equal weight are mounted upon such small shafts or on such weak supports. The suspended ones are especially liable to the destructive action above described, as their frames are generally far too weak.

Fig. 3 illustrates the effect of a lateral blow on the rim of a fly-wheel. Of course the effect is much exaggerated in the flexible wheel, but it shows the form taken by the rim under a blow, the blow producing a much greater effect on the wheel while in motion than when at rest.

NEW INVENTIONS.

An improvement in the manufacture of embroidery has been patented by Mr. John Wiget, of Arbon, Switzerland. The object of this invention is to embroider eyelets, spiders, sprigs, dots, or any other figures in such a manner that the figures shall be connected together only by embroidery thread.

Mr. Daniel Aubert, of Sainte Croix, Switzerland, has patented an improved musical box. This invention relates to mechanism for musical boxes to increase the time of working, and admit of their being placed in a clock case in connection with a clock, for example, only to be wound up every eight days. at the same time as the clock is wound,

An improved rotary registering measure for linear measurements has been patented by Mr. Lewis W. Brown, of Osage City, Kan. The invention consists of a circular case or frame containing a unit and a tens wheel of equal diameters, provided with suitable figures on their rims, and holding between them a pinion, which is attached to the handle of the device, and of a larger circumferentially toothed wheel secured upon the hub of the unit wheel that they may revolve together, so that as the device is moved over the face of an object the larger wheel is made to revolve and turn the unit wheel once in each revolution, while at each revolution the unit wheel causes the tens wheel to move through a tenth of a circle, both the unit and tens wheels presenting, as they revolve, figures that indicate the measurements of the object over which they have been moved.

Mr. George W. Healey, of Jackson, Mo., has patented an improved horse detacher. The invention consists of a forward curved stud inserted in each end of a singletree to receive the rear ends of the traces, of springs secured on the face of a singletree and bending down in contact with the studs to prevent the traces from accidentally slipping off, and of a wire or rod connecting the springs, by which the springs are raised from the studs so that the traces may become disengaged.

An improved mosquito-netting frame for bedsteads, which is simple, light, durable, and convenient, has been patented by Mr. Alfred H. Bailey, of Palestine, Texas. The invention consists of a mosquito netting frame formed of two longitudinal rods fastened to uprights attached to the bedposts, and held by cords or wires passing from the outer ends of each of the rods to the top of each upright.

An improved toy pistol which is to contain a certain quantity of ammunition, fed every time the trigger is pulled, thus permitting repeated firing without reloading, has been patented by Mr. Henry Klassert, of Buffalo, N. Y. The invention consists of a pistol frame with a removable side, in which frame the trigger and hammer are mounted on the same pintle, the hammer having a forked lever pivoted to it in such a manner that when the pistol is cocked the forked lever rotates a friction wheel around which a percussion tape passes.

An improvement in that class of devices that are designed for opening, closing, and locking blinds and shutters, has been patented by Mr. Joseph S. O'Brien, of North Wilbraham, Mass. It consists of the combination of an improved spring hinge for throwing the blind out of a locked position, a spring catch, and attached cord for pulling the blind fully open or closed, and locking it in both positions.

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A CURIOUS INHABITANT OF THE SARGASSO SEA AND ITS NEST.

What is generally known as the Sargasso Sea is the vast area of 260,000 square miles, more or less, to the west and southwest of the Azore Islands, reaching to the Bahamas westward, and finding its northern and southern boundaries in the 36th and 19th degrees of latitude. Other areas, notably that in the Pacific, five hundred miles E. S. E. of New Zealand, and, again, one thousand miles west of San Francisco, possess the same characteristics, but the former is the best known and defined. The great Atlantic currents form a gigantic eddy, thus collecting the algæ that forms its component parts. The vegetable fauna is generally comprehended in the two genera, *Fucus* and *Sargassum*, of the latter two species, namely, *vulgare* and *bacciferum*.

The disconnected masses of weed that make up the "Sargasso Sea" are usually "from a couple of feet to two or three yards in diameter, sometimes much larger; we have seen, on one or two occasions, fields several acres in extent, and such expanses are probably more frequent nearer the center of its area of distribution. They consist of a single layer of feathery bunches of the weed (*Sargassum bacciferum*), not matted, but floating nearly free of one another, only sufficiently entangled for the mass to keep together. Each tuft has a central brown thread-like branching stem studded with round air vesicles on short stalks, most of those near the center dead and coated with a beautiful netted white polyzoon.

After a time vesicles so incrusted break off, and where there is much gulf weed the sea is studded with these little separate white balls. A short way from the center, toward the end of the branches, the serrated willow-like leaves of the plant begin; at first brown and rigid, but becoming, further on in the branch, paler, more delicate, and more active in their vitality. The young fresh leaves and air vesicles are usually ornamented with the stalked vases of a *Campanularia*. The general color of the mass of weed is thus olive in all its shades, but the golden-olive of the young and growing branches greatly predominates. This color is, however, greatly broken up by the delicate branching of the weed, blotched with the vivid white of the incrusting polyzoon, and riddled by reflections from the bright blue water gleaming through the spaces in the network. The general effect of a number of such fields and patches of weed, in abrupt and yet most harmonious contrast with the lanes of intense indigo which separate them, is very pleasing."

The animal life of this area is characteristic and has certain peculiarities well worthy the attention of the student. It consists of shelless mollusks, as the *Scillœa pelagica*, a short-tailed crab, the *Nautilograptus minutus*, quantities of membranipora, and a peculiar fish, the subject of our illustration, known as the *Antennarius marmoratus*. The writer was fortunate in observing the latter on the outskirts of this vast area. It forms one of the most interesting examples of the many creatures that find safety in protective resemblances. As above mentioned, the weed as it floats assumes all shades of olive, and the fish in color is its exact prototype, flecked with irregular patches of darker and lighter shades. Not only in color does it mimic the weed, but in general appearance, the head and fins being dotted here and there with fantastic barbels of flesh that to the ordinary observer seem bits of weed growing upon it. Even the white polyzoon growing on the algæ is imitated, and a careful examination is necessary to distinguish the fish from its surroundings. It was oftener found lying in among the weed, but where the patches were small, was frequently seen lazily swimming around in clear water. Its nest, seen in the accompanying illustration is, no less a curiosity. It is a round or oval ball of weed, intwined and wound together in a most complicated manner by an invisible viscid secretion from the fish. The pieces of weed are first roughly caught together, and the eggs deposited among the branches; then the invisible bands are wound around, gradually drawing them into the oval form, about as large as a base ball. The instinct, and its peculiar endowment by nature, place this fish among the most interesting of the finny tribe.

A CURIOUS INHABITANT OF THE SARGASSO SEA AND ITS NEST.

The Number of Botanical Species.

Dr. Muller, of Geneva, has recently made the following calculation as to the total number of existing botanical species: We have at present described in our books about 130,000 species; and if we suppose that, in round numbers, 30,000 belong to countries like Europe and North America, where there are hardly any species, excepting some cryptogamic ones, to be discovered, the remainder, or 100,000, representing exotic plants, more or less tropical and southern, we may double the latter for new species, giving 200,000 for these less known regions, and altogether 230,000 for the whole globe, with the exception of countries still quite unknown botanically. Adding only 20,000 species for the latter, we reach a minimum sum of 250,000 species of plants.

SEVRES VASE.

We give an engraving of a vase from the manufactory at Sèvres. It is of the *pâte dure* variety, and has all the finish and beauty for which the productions of the Sèvres factory are noted.

SEVRES VASE.

The Musk Ox as a Geographical Clew.

Until recently it has been supposed that Wrangell Land—where Lieut. De Long hoped to spend the first winter of the Jeannette expedition—had never been visited by civilized man. It has now come to light that a German trader, Capt. E. Dallmann, made two landings there in the summer of 1866. His neglect to claim public credit for his discovery till now would appear to be due partly to his ignorance of the geographical significance of Wrangell Land, and partly to the fact that he has been away from Europe since that region came into prominence in connection with the Jeannette expedition.

On his first visit Captain Dallmann landed in latitude about 70° 40′ north and longitude 178° 30′ west. The land formed on the southern side a rather deep, wide, open bay, lying west of a ridge about five hundred feet high. To the eastward of this ridge the land stretched more to the northeast. The land, as far as he could see, had a narrow and level beach, like the northeastern coast of Siberia, behind which it rose to heights of from five hundred to one thousand feet, the last named elevation, however, occurring rarely. He saw no signs of human habitations, but found a great many tracks of animals, apparently those of polar bears, foxes, and musk oxen.

Speaking of the reference to the last named animal, and of the statement made elsewhere by Captain Dallmann, that he purchased the horns of musk oxen from native hunters in Northern Siberia, Mr. George Keunan (who is soon to lead a government expedition to the north coast of Alaska) says:

"The musk ox is a native of Arctic America and Greenland, and is entirely unknown in Siberia. If, therefore, that animal exists on Wrangell Land, the fact points to an extension of that land across the Pole, or to its junction with Arctic America at some point north and east of Point Barrow. The fact, so far as it goes, tends to corroborate other evidence, or at least indications, which we have, that the Arctic Ocean north of Behring Strait and east of Wrangell Land is a partially inclosed sea, with Wrangell Land and perhaps a chain of islands for its western and northern boundaries. The fact that natives of the North Siberian coast were in possession of the horns of musk oxen is significant in still another way, since it shows that those natives must have crossed Long's Strait and hunted the animals where Captain Dallmann saw their tracks, viz., on Wrangell Land. Finally, Captain Dallmann's statements, taken in connection with that of Captain Long, of the bark Nile, prove that during two consecutive seasons—1866 and 1867—the southeastern coast of Wrangell Land was easily accessible, and the adjacent sea entirely free from ice."

Lethe and the Gardens of the Hesperides.

At the recent meeting of the American Geographical Society in this city, Lieutenant Commander Gorringe read an entertaining paper entitled "A Cruise along the Northern Coast of Africa." Describing a trip from the Gulf of Gabe to the site of the proposed "Inland sea"—a desert area of about 3,000 square miles, which the French talk of flooding by means of a canal, over a hundred miles long, through the Chotts of Algeria—the reader said:

"In the neighborhood of Benghazi the surface of the ground is frequently broken by precipitous chasms, fifty or sixty feet in depth; at the bottom there is invariably a surface of rich soil, and also an abundant supply of moisture. The change from the arid and barren surface of the surrounding desert to these spots of luxuriant vegetation is very striking. The gardens of the Hesperides are believed to have been in the vicinity of Berenice, and many are of the opinion that these fertile spots at the bottom of the chasms are what remains of them. In one of the chasms, about seven miles from Benghazi, is the entrance to a cave which leads to an extensive sheet of water, believed to be identical with the river Lethe. I transported a boat across the desert on the backs of two donkeys side by side, and launched it on the waters of this famed river, which we found clear and cool and fresh as if constantly supplied by springs. It appears to run through a series of chambers, with very narrow passages connecting them, in which we observed a sensible current. The walls of the chambers are in part at least artificial, and on them are engraved many inscriptions. No extended exploration of this curious subterranean stream has ever been made; no one knows where it comes from or where it goes to, and it would be very interesting to find out, and instructive to copy the inscriptions, some of which are believed to be in Punic characters. I can very well understand the extravagant terms in which the ancients described the Lethe. In the spring there prevails along this coast a hot air blast—it cannot be called a wind—that comes from the great desert further south. The air is laden with insects and fine particles of sand, and is hotter and drier than any one who has not experienced it can conceive of. I have observed a temperature of 131° Fahr. in the shade during one of these blasts, called by the natives *oiblehs*.

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On one occasion I was indiscreet enough to wet my head with salt water, in my efforts to allay the intense suffering caused by necessary exertion. In a few moments my head was coveved with a crust of salt, so rapid had been the evaporation. These winds rarely last through the night, and usually return each day for three or five days. My theory in regard to the Lethe is that it was an artificial subterranean retreat from the discomforts of these hot winds for the inhabitants of the ancient city, who were certainly wealthy enough to create it, if we may judge from their other works on the surface. The temperature of the air in the cavern keeps uniformly at about 65°, and that of the water about 55° Fahr. The waters of the Lethe are famed in ancient poetry for preserving youth and life; in contrast with the dry, hot blast of a gibleh, with its depressing influences on body and mind, the cool and moist atmosphere of the cavern justifies almost any assertion.

The Official Examination of Patents.

Many persons who suggest improvements in the patent law of Great Britain propose that patent specifications shall be officially examined for novelty before a patent shall be granted. A very high value is set upon this scheme; and it is commonly held that by carrying out the examination system thoroughly it would be found possible to eliminate nearly all the existing defects in the working of our patent law. Only the examination would not reduce the cost of a patent. Given low fees and efficient examination, and nothing more would be demanded by hosts of grateful inventors. It is not to be disputed that the theory of prior examination has something to recommend it. It seems at first sight to be clear that the state has no right to grant a worthless patent to an inventor in return for his fees; and it also seems to be right that the state should, in granting a patent, give the world a kind of guarantee that the invention patented was a new thing. But when, instead of glancing hastily at the matter, we carefully consider the bearings of the questions involved, and the whole theory of patent law as practiced in this country, we soon find reason to doubt that prior examination is a good thing; and if we turn to the United States, where examination is practiced, we shall find nothing to encourage the belief that the system can ever be made to work well.

The arguments in favor of official examination are very few, however cogent they may be. They are, as we have said, that the state ought not to sell to any one that which has no value, and that by stopping the intending patentee at the very outset from protecting an old invention, much trouble will be saved to manufacturers, an enormous amount of litigation will be got rid of, and the patents which pass the necessary ordeal will acquire a hitherto unknown value. As a minor consideration patentees and their agents will save the cost and time spent in making searches. If anything else can be urged in favor of the official examination it has escaped our notice. It will be seen that the examiners can do nothing more than say that a given invention is new or old. The value of the verdict when the invention is pronounced to be old is comparatively small. It is represented probably by the fees which the inventor will not spend under the circumstances. Its value as regards the invention pronounced to be new may be very great indeed. It may give a man an indefeasible title to a property worth many thousands of pounds. But it is obvious that, in order that this may be the case, the verdict of the examiners must not admit of being questioned. If they say that Mr. John Smith's invention for improvements in penny whistles is new, then it must not be open to Mr. James Brown to say that the examiners were mistaken as to the scope of the invention; nor must Mr. Green be permitted to refuse to pay Mr. Smith a royalty on the ground that he had made whistles of the kind patented for years; nor may Mr. Robinson assert that the specification is so badly drawn that the only whistles which it really covers cannot be made at all. If the verdict of the examiners is open to revision, then it is quite clear that it does not give an indefeasible title.

It is said now that no patent in Great Britain is really valid that has not been proved to be so by the result of an action at law. There is no doubt a substratum of truth in this statement. But assuming that the verdict of official examiners is not sufficient to keep patentees out of the law courts, then it is evident that the value to be attached to their verdict is much reduced; and it is easy to see that if the result of a little litigation was to overset the examiners' verdict in, say, half a dozen cases in the year, that verdict would almost cease to have any value whatever. In other words, if the verdict of the examiners is to give an indefeasible title, then the examiners must be infallible, in fact or by law. It is clear that no mortal can comply with the first condition, and it is equally clear that if it was enacted by Parliament that the verdict of examiners should invariably be regarded as final, a very wide door indeed would be opened for the entrance of injustice. It appears, therefore, that there must be in all cases a power of appeal. In other words, the verdict of the examiners as to the novelty would be taken for what it was worth, and we should have trials by jury just as we have now when disputes arise about priority of invention.

In the United States an attempt is made to get over the difficulty. There is a large number of examiners; so many, we believe, that it is possible for each to give quite half an hour to ascertaining whether an invention is or is not new. The rule is not to give the inventor the benefit of a doubt, but to refuse a patent on the ground of want of novelty. Then the inventor can apply to a higher grade of examiners, and counsel can be heard in his favor. In other words, the patentee begins with something very like a lawsuit to prove the novelty of his invention. If the verdict is in his favor, then the value of his patent is, no doubt, augmented; but the cost of the trial is very considerable. It may amount, and sometimes does, to several hundred pounds. If the case is not of such importance, the patent examiners will send for the patentee or his agent, and call on him for explanations, and in the end will grant him either the whole or part of what he claims.

Thus, to return to Mr. Smith and his penny whistle; he perhaps claims the use of a vulcanite instead of a wooden block in the mouthpiece, the making of a ninth hole, to give an extra note, and the introduction of a rivet at the lower end of the whistle, because solder sometimes does not flow well to the end of a lap joint, and ripping ensues. The examiners, after hearing all that Mr. Smith has to say, grant him a patent for a whistle with a vulcanite mouthpiece; but they will not grant one for the ninth hole, because flutes have more than nine holes; nor will they grant a patent for the rivet, because the ends of cask hoops make a lap joint and are secured with rivets. Mr. Smith has to be content with what he gets; but some one else subsequently obtains a patent for the ninth hole, and a third man secures the rivets, much, of course, to Mr. Smith's satisfaction. In saying all this we exaggerate not at all.

Every American who has had experience at the Washington Patent Office will bear witness to the truth of our statements. In all this we have really a desperate, but legitimate, effort to make examination a genuine thing, and not a farce; and it is not to be denied that if the system was properly carried out it would prove of great use. But let us consider what doing this means. As it is, the American examiner carries, no doubt, a great deal in his memory, and is able to say at once that certain inventions are not new; but this does not prevent the patenting every week of old ideas to a surprising extent. He is also able to say that certain parts of other inventions are not novel; so can every respectable patent agent in Great Britain. The American official must, however, be in doubt again and again, and he satisfies his official conscience by giving an inventor in such cases only one-half or one-third of what he asks for. But this is a very defective system. It means an indirect pleading guilty to a charge of incompetence as an examiner. It can, however, only be got rid of by making the examination really perfect, and it is impossible to do this. An examiner may know what has been patented before, but no board of examiners can be supposed to know all the devices which are and have been in use for years without being patented, any one of which would suffice perhaps to render half a dozen patents invalid.

Let us bear in mind that almost every week cases are tried in which all the skill of counsel, the acumen of a judge, and his power of analyzing the evidence of an army of "expert" witnesses, barely suffice to settle whether a certain invention is or is not new, and consider what it is that an examining tribunal must be expected to perform. Is it not obvious that the examiners must discharge the combined functions of judge and jury, and is it not evident that the value of their verdict will depend largely on the fullness and accuracy of the evidence set before them? This being so, the whole machinery of a law court, now resorted to only as a last resource and with comparative rarity, would have to be used before more than at most one-half the patents now granted could be confirmed.

It may be urged that this is going much too far with the thing—that it will suffice if the examiners are moderately diligent and careful. To this we reply that unless the verdict of the examiners is to be regarded as practically final, it possesses little or no value. Under the supposed conditions the entire system may do more harm than good by leading to the summary rejection of really valuable and novel inventions on very frivolous grounds. This is the grand objection to the scheme. If it is not perfect it is worse than useless; and to make it even nearly perfect it must be enormously expensive in its working.

The objections, on the other hand, which can be urged against the existing British system are very few. It is true that patents which are worthless are granted, and that pretty freely, but the mischief done thereby is not very great. It will be found, as a rule, that no two inventions are really identical, although there may not be any legal distinction between them. If an old thing is patented it can do no harm to any one else, unless it possesses sufficient merit to make it worth while to work it. It will then usually be found that the patented invention is really better than that which anticipated it, and the world is not the loser by the patent.

A case in point occurred some years ago. An invention for cleaning grain was patented; on inspection, however, it appeared that the new thing was neither more nor less than the old winnowing machine. As a matter of fact, however, the new grain cleaner had within it a board so set that it divided the current of wind, and did what the old machine did not, make a clean sample. The specification was beyond question bad as it was drawn, but no one was the worse of its existence.

The owners of a patent, valid or invalid, cannot prevent a man from using a machine or a process which he had used previous to the date of the patent, and any attempt to compel the payment of royalties would end in a discovery of prior user. We suspect that the instances in which royalties are paid on patents for inventions absolutely old right through are very few indeed, and that when a royalty is paid the owner of the patent has some substantial claim to it. But whether this be the case or not, and even if we concede that it is not the case, and that thousands of pounds are paid every year in royalties on worthless patents, we cannot see at all that a crude and insufficient examination would help to set matters right, even though it have official sanction.

There remains one argument to be considered, namely, that the state has no right to sell an inventor a worthless patent. It seems to us that the well recognized principle of *caveat emptor* applies accurately to this case. Let the purchaser look to his own interests. The law expects that every man shall use some caution in his dealings with others. Thus, for instance, a general warranty of soundness for a horse will not be taken to cover obvious defects, such as the want of an eye or a tail. The law says that a purchaser must see for himself whether the horse which he buys has or has not a tail. In the same way due facilities are supposed to be provided to enable would-be patentees to ascertain whether their inventions are or are not new. If they do not use these opportunities, and should discover subsequently that they have patented what was not novel, they have themselves to thank for the loss of their money.

Finally, we may add that competent patent agents are always willing to make a search for inventors which will give them quite as good a title as anything done officially in the United States can confer. But most inventors object to the cost and delay, and take their chance. We have shown, however, that if the official system of examination is to be really worth anything, it will introduce elements of cost and delay which would be regarded as intolerable by the great mass of British inventors.—*The Engineer.*

Study of Bones.

Prof. O. W. Holmes has introduced into the Harvard Medical School a decided improvement in the study of osteology. While abroad, during the summer, he purchased for the school ten skeletons, each of which has been divided into parts—skull, thorax, spine, legs, and arms. These parts are each provided with a wooden box with a sliding cover, and a handle to carry it with. The parts are distributed to those students who desire them on a stated day. Each box is lettered and numbered, and the student enters his name with the letter and number of his box in a book kept for the purpose. The parts are kept six days, a fine being incurred for each day beyond the prescribed time.

This plan of circulating bones is of great use to the student, as it enables him while reading to locate and fix various facts by actual observation, about the only way, indeed, in which the facts can be fixed. By the study of the bone a practical working knowledge is obtained, which it is not possible to gain from mere reading. Any one who has studied osteology "by the book," and then gone to the skeleton for confirmation of facts, must have been struck by the great dissimilarity of his ideas of the subject, and the facts as found. No matter how precise and carefully worded the description of an object may be, we fail to fully comprehend it, unless we see the object itself; and by seeing and handling the object we can clinch the facts about it into the memory, so that they will not easily drop out.

A system somewhat similar to this one is in use in the Columbus Medical College of Ohio. Here the bones under discussion are handed to the class during the lecture, and the various points are verified by the students as they are mentioned by the lecturer. The method of the Harvard School seems better, inasmuch as the bones are taken to the room of the student and there studied at leisure, and all their various points seen in their relation to each other.

The Longitude of the Chinese and Japanese Coasts.

Lieutenant-Commanders F. M. Green and C. H. Davis, Lieutenants S. M. Ackley and John Morris, and Surgeon Dale, of the United States Navy, have been detailed by the Navy Department to determine the exact longitude of certain points on the Asiatic coast of the Pacific Ocean. The American officers have permission from the cable companies to establish stations and use the cables at night for this purpose.

English officers are now engaged in a similar work in New Zealand and Australia. The information obtained by the observations will be exchanged by the two nations. English officers have determined the longitude as far as Madras, and Russian officers have made observations on the Siberian coast. All observations have been taken from the Hong Kong Observatory. The American party will ascertain the precise longitude of that place, there being a question as to the accuracy of the standard. The object of this movement by the Navy Department is to establish correct standards, from which true charts for the protection of maritime interests may be produced.

Natural History Notes from West Africa.

A paper on the fauna and flora of the gorilla country, written by Hugo von Koppenfels, at Corisco, West Coast of Africa, was read at a recent meeting of the New York Academy of Sciences. The writer has been exploring a little-known region in Equatorial West Africa, where the gorilla is at home. The range of the chimpanzee is much wider, including all of tropical Africa. The writer stated that it is now proved that crosses occur between the male gorilla and the female chimpanzee; also that the chimpanzee of Northern Guinea differs essentially from that of the southern part of the same country. The names *m'schigo*, *m'couve*, *koolo*, *baboo*, *soko*, and *koolookambla* are only different designations of the chimpanzee by different tribes.

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OZONIFEROUS PLANTS.

Ozone is a mysterious element found in the atmosphere under certain conditions. It long puzzled scientific men as to its nature and composition, but it is now considered to be oxygen in an allotropic state, or the property possessed by some simple bodies, of assuming different qualities when subjected to certain modes of treatment. Its varying quantity in the atmosphere is supposed to affect the health of man. By some it is supposed to be oxygen condensed to two-thirds of its bulk. It is insoluble in water and in solutions of acids and alkalies, except in potassium iodide. It possesses very powerful bleaching and disinfecting powers, corroding cork, caoutchouc, and other organic substances, and rapidly oxidizes iron, copper, silver when moist, iodine, and dry mercury; and also has an irritating effect upon the lungs when in any large quantity in the atmosphere. It has a peculiar, somewhat metallic odor. It is produced when a current of electricity is passed through dry oxygen or atmospheric air; or by allowing phosphorus to burn in contact with water in oxygen or air, and also by different other processes.

Many trees and plants are supposed to evolve ozone, or to aid in producing it in the air, and so by its powerful oxygenizing qualities to destroy the disease-breeding germs floating in the atmosphere. Not that all plants do so, for there are some which are reasonably credited with producing malaria. This power of evolving ozone is strongest in sunlight, and often quite feeble at night. Although ozone is a recent discovery, yet the power of certain trees and plants to prevent malaria was well known centuries ago. A species of thyme was in such high repute for this purpose as to be held sacred to Vishnu. The disciples of Empedocles, one of the Grecian philosophers, planted aromatic and balsamic herbs near their dwellings to ward off malaria. Our English ancestors considered camomile and fever-few to have a similar effect. Places in which the sweet bay tree grew plentifully were considered by the Romans as being secure against infectious diseases. The antimalarial powers of the *Eucalyptus globulus* and other species are fully proven by the effects they have produced in Algeria, Corsica, Cuba, the Cape of Good Hope, Australia, and other places, having rendered almost uninhabitable regions perfectly healthy. Malarial diseases are also rare in sections of country in which pine trees or other coniferæ are abundant. In places where certain odoriferous plants are grown in large quantities, for the purpose of obtaining their essential oils, all such diseases are rare. The essential oils obtained from such plants also have similar effects when exposed to sunlight; and in a lesser degree such perfumes as eau-de-cologne, essence of lavender, extract of millefleurs, etc., all attributed to their power of producing ozone. Other plants, however, which do not produce essential oils, appear to have a similar power of preventing malarial diseases, or of rendering malarious districts healthy. In some parts of the well-known Campagna, near Rome, immense areas of thistles rendered the localities where they grew quite healthy, but upon their being destroyed, these districts became again unhealthy. In this country, in Holland, in the Mauritius, and other places, the planting and cultivation of the common sunflower has had remarkably beneficial effects in destroying malarial poison.

All odoriferous plants do not produce such effects in destroying the malarial germs in the atmosphere. There are some, such as the *Daphne mezereum*, the oleander, the wall flower, the pride of China (*Melia azedarach*), and others, which are actually deleterious when planted in great numbers. Besides the plants supposed to produce or evolve ozone, and hence called ozoniferous plants, there are others which have powerful disinfectant qualities, but whether they are ozoniferous has not yet been determined. The plants we have already noticed as such give off their emanations into the atmosphere, and the malarial germs are destroyed by the oxidizing power of the ozone burning them up. The plants of which we are about to speak have the power of disinfecting water, or destroying the organisms or gases which are deleterious to health. Whether malarial diseases are produced by infinitesimally minute organisms or by gases, is a matter of dispute, but they are most probably produced by germs which our microscopes have not yet been able to detect. This is becoming more and more the accepted theory. It is very probable that these water-purifying plants give off ozone by means of their leaves and roots, and thus destroy the germs in the water in which they grow. Very few, if any of them, produce essential oils or resins, but, as in the case of thistles and the sunflower, these do not appear to be indispensable in the formation of ozone. Among such plants are nearly all of our various pond weeds, such as float on the surface as well as those that are immersed, and some that are submerged. Many of our bog plants and some of those that grow on the borders of streams also appear to have the same power. In India, the West Indies, and in Africa, there is a species of duckweed, *Pistia stratiotes*, which possesses this purifying power in a remarkable degree. It will, in a few days, sufficiently purify stagnant water to admit of fish living in it, but at the same time makes it unsuitable for drinking purposes, rendering it so acid as to produce intestinal fluxes.

Now that malarial diseases are so common and produce such a large amount of suffering and death, the mode or means of preventing the development of the germs which produce them should be carefully studied and investigated. If the planting of certain odoriferous plants about our houses, or the stocking of ponds, streams, and marshes with plants producing similar beneficial effects, will destroy them, it certainly ought to be tested in an intelligent way by careful experiment. That some plants will do it is certain; they may not be desirable to have about our dwellings, but others more desirable and ornamental will no doubt be discovered when sought for. By our strict utilitarians, the study of botany and the culture of flowers are considered to be a waste of time, producing no useful results whatever; but the time is not far distant when they will be considered as highly useful pursuits. Realizing that an ounce of prevention is better than a pound of cure, our medical sanitarians are devoting much time to the study of the prevention of disease. The subject which we have thus so cursorily glanced at is one that commends itself to their attention.

The Utilization of Refuse.

A system of destroying the noxious properties of refuse, and converting it into more or less useful matter, has now had a fairly extended trial at several towns in England, notably Leeds, Blackburn, Warrington, and Derby, and has been found fairly successful. Leeds has led the way in these improvements, and the municipal authorities are satisfied with the result. The furnaces and other appliances were designed by a Mr. Fryer, of Nottingham, and their first practical trial was made at Burmantofts, about two miles from the town hall of Leeds, by the erection of a six-celled destructor and a carbonizer. The destructor consists of six (or more) compartments or cells, built in brick, lined with firebrick, and tied together with iron rods. It occupies a space of 22 feet by 24 feet, and is 12 feet in height. An inclined road leads to a platform over the top, and another incline leads from the level of the firing-floor to the adjoining road. Each cell is capable of destroying or carbonizing seven tons of refuse in twenty-four hours, and to secure the greatest economy the work goes on uninterruptedly. The cells consist of a sloping furnace, with hearth and fire-grate covered by a reverberatory arch of firebrick, with one opening for the admission of refuse, another for the escape of gases, and a furnace door for the removal of clinkers.

The refuse is emptied on the platform, and shoveled into the cell, falling first on the incline, thence reaching the sloping hearth, whence, when sufficiently dry, it is pushed on to the fire, where, owing to the radiant heat of the firebrick arch, it burns fiercely, the products of combustion being gases, a fine ash, and clinkers. Every other cell is provided with an opening large enough to take in infected bedding, mattresses, etc., as well as diseased meat. The gaseous products of combustion pass through a flue to a boiler, which supplies steam to a horizontal engine driving two mortar mills. In these mills the clinkers are mixed with lime, and ground into an excellent mortar, which sells readily at 5*s.* a load; while the tin cans and iron are sold for old metal. No fuel of any kind is required, the cinders and other combustibles found in the refuse supplying all that is needed.

During the year 1879 the following is an account of the work performed by the Burmantofts destructor: 14,000 tons of rubbish, 190 beds and mattresses, 264 carcasses of pigs attacked by some fever, 1 cow, 10 sheep and lambs, 28 quarters and 13 cwt. of bad meat. The staff required for each "shift" comprises a foreman, who acts as engine driver, four furnacemen, and one laborer.

Besides the destructor there is also a carbonizer, which is necessarily built in a different manner, as it is used to convert street refuse and vegetable matter into a charcoal, which sells at the rate of 30*s.* a ton. The carbonizer consists of a group of brick cells, each having a separate furnace. It is 26 feet long, 12 feet wide, and 15 feet 6 inches high. The "shoot" is fitted with sloping plates, which project from its sides and form a kind of spiral eave or ledge, which, near the bottom of the cell, takes the form of a fire-block, resting on a wall which divides the contents of the cell from the gases of the fire. The vegetable and other refuse to be converted into charcoal is filled into this shoot or well in a solid mass, the eaves or ledges forming on their underside a flue, so that the matter is gradually heated as it slips down the well, until at the bottom it is surrounded by nearly red-hot firebrick. The charcoal is withdrawn at the bottom, and is placed in a cooler worked by the steam engine, and each cell is capable of treating 2½ tons of vegetable and street refuse in twenty-four hours. The cost of a complete establishment, with a six-celled destructor, an eight-celled carbonizer, boiler, engine, mortar mills, buildings, etc., is £4,500. No nuisance of any kind is experienced in the vicinity of the depots, and the refuse which might, under other circumstances, be deposited in places where it would become the hotbed of disease, is effectually destroyed or utilized.—*Building News.*

Potassic Hydric Saccharate.

Pure cane sugar is dissolved in boiling water in a wide deep test tube until a boiling saturated solution results. To this liquid an equal bulk of strong nitric acid is added, and the mixture warmed until the reaction commences. This is very violent, and results in the disengagement of voluminous brown fumes. After the evolution of gas has ceased, the liquid is boiled. It is then, while hot, divided into equal parts, and one-half neutralized with a strong solution of caustic potash. To this the other half is added, when after a short time an abundant precipitate of acid saccharate is obtained. The salt, if slightly colored, is easily purified by passing the hot solution over animal charcoal, evaporating to a small bulb and recrystallizing.—*Thomas Bayley, in Chemical News.*

BLACKFORD'S TROUT SHOW.

The annual exhibition of trout in Fulton Market, which signalizes the opening of the season for that game fish, began on Friday, the 1st inst., and lasted two days. That popular interest in the propagation and cultivation of fish for food is wonderfully on the increase was evidenced by the throngs which attended the show even during the most inclement weather. Not only was the mercantile community represented, but among the visitors were noticed many well known lights of the literary, social, scientific, and artistic world.

Beside the display of fish, there were other attractions. There was a plaster cast from the Smithsonian Institution of a brook trout (*Salrelinus fontinalis*), weighing 11 pounds, caught in Rangely Lake in October, 1880. A collection showing the different stages of the manufacture of shell fish hooks, from San Nicholas Island, California, and shell fish hooks made by the Indians of the Pacific Coast islands; a prehistoric bone harpoon from the Dordogne Cave, France; flint tools used in the fabrication of shell fish hooks; the Feuardent collection of fish hooks; prehistoric bronze fish hooks from the Lake dwellings of Switzerland; Franklin bronze fish hooks from Normandy; Commander H. H. Gorringe sent a bronze of an Egyptian sacred fish and a Græco-Roman bronze box designed after a sea crab.

But the trout stand was the magnet, for here were specimens of the speckled beauties from Canada, Maine, Connecticut, Vermont, New Jersey, Pennsylvania, the Empire State, England, and remote California; indeed to the California exhibit must be awarded the palm. There were trout in tanks and trout in banks; live trout and dead trout; big trout and little trout; trout reclining on beds of moss, and trout suspended in bowers of roses. The two principal exhibitors of California trout were B. B. Redding, Fish Commissioner, and M. T. Brewer, of San Francisco, the following specimens being specially worthy of notice: Fish Commissioner Redding sent an exhibit of Truckee River trout, a large black spotted fish which grows from six to ten pounds weight.

Lake Tahoe trout, also a black spotted fish, but much larger than the Truckee River trout. It averages about twelve pounds in weight, although they have been caught weighing as high as seventeen pounds.

The Dolly Varden trout, so called because covered with variegated blotches. It is a small but gaudy fish, and weighs from three to four pounds.

Rainbow trout, from the McCloud River. It has a brilliant stripe from head to tail, and was quite a feature in the exhibition.

Mr. M. T. Brewer's exhibit, which did not arrive until late on Saturday, was comprised of nine distinct varieties, as follows:

Truckee River land-locked salmon trout.
Lake Tahoe salmon trout.
Independence Lake trout.
Donner Lake speckled trout.
Humboldt salmon trout.
Silver Mountain salmon trout.
Pyramid Lake speckled trout.
Truckee River red trout.
Sacramento River salmon.

Among the most interesting exhibits were the following: White Brook trout, from White Brook, Richmond, Rhode Island. "Speckled trout," light color, spots very small, W. H. Robinson, Patchogue, L. I. Wild trout, color very dark, by Mr. Hogan, Quebec, Canada. South Side Club, Long Island, heavy display of cultivated trout. Fry of English trout, W. L. Gilbert, Plymouth, Mass. Clark's trout, L. A. Beardsly, Sitka.

South Side Club, L. I., dead brought one dollar per pound, alive out of tanks, one dollar and fifty cents per pound, fresh caught salmon one dollar and seventy-five cents per pound, while wild trout bring only thirty cents per pound retail.

In fish novelties were viviparous perch from California, which unlike other fish do not spawn, but bear perfect young.

Lamprey eels were exhibited, and attracted no little attention, as very few people seemed to know what they were.

An immense live specimen of marine lobster weighing 22 pounds was exhibited. It was covered with an ancient growth of barnacles and seaweeds, caught off the Massachusetts coast.

"Lump fish," "Jelly fish," "Indigo bag," so called by fishermen from the fact of its being a deep transparent blue, and in shape like the old-fashioned indigo bag used by laundresses. There was an exhibition of fresh water insects, that prey on young trout, and living natural food of trout.

To DYE STRAW HATS BLACK.—In order to obtain a level color a solution of gluten is added to a lye of soda, which is allowed to stand for twenty-four hours and filtered. The hats are then steeped for twelve hours in the clear liquid. The straw is thus freed from grease, and the mordants of nitrate, sulphate or acetate of iron, as well as the decoction of logwood mixed with sumac or galls, is very evenly taken up by the fiber. A slight addition of bichromate of potash improves the tone of the dye, and the goods are finished with gum or gelatine.—*Baden Gewerbezeitung.*

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Safety Boilers. See Harrison Boiler Works adv., p. 252.

Gould & Eberhardt's Machinists' Tools. See adv., p. 252.

Wanted—Patents and Specialties to sell. Special advantages offered. S. M. Thompson, Providence, R. I.

Van Beil's "Rye and Rock" has cured more colds and coughs than all other remedies.

Ladies who would combine beauty and comfort in dressing the feet, should use the German Corn Remover.

Fine Taps and Dies in Cases for Jewelers, Dentists, Amateurs. The Pratt & Whitney Co., Hartford, Conn.

Inventors sending a three cent stamp to Inventors' Institute, Cooper Union, New York city, will receive a copy of the *Industrial News* free.

There is no Cider Press now in use that produces such satisfactory results as Messrs. Boomer & Boschert's. It is built on scientific principles, and is indorsed by every one who has examined them. New York Office, 15 Park Row.

Capital wanted to manufacture a high speed, first-class Automatic Cut-off Engine. Patented, and indorsed by the highest mechanical authority. Address P. O. Box 1042, Batavia, N. Y.

Situation wanted in a manufacturing or business house by a young man of 22; good address and some business experience. References the very best. Address Lock Box 985, Providence, R. I.

Avoid the expense and evils attending the use of compounds in your boiler. Remove the sediment contained in feed water at small cost by Hotchkiss' Mechanical Boiler Cleaner. Circulars free. 84 John St., New York.

Good Machinists and Vise Hands wanted. Address Watertown Steam Engine Company, Watertown, N. Y.

Sufferers from corns will find sure relief in German Corn Remover. Sold by all druggists. 25 cts.

Rock Drill, with Hose and Portable Boiler. Machinery Exchange, 261 N. 3d St., Philadelphia, Pa.

Engines and Boilers: 16 x 48, 15 x 30, 13 x 30 inch Horizontal; 16 x 28 Upright Engines; 30, 40, and 80 H. P. Locomotive Boilers; 20 to 45 H. P. Horizontal Tubular Boilers. Second-hand, but guaranteed in good order. Full line second-hand Wood-working Machinery. Send for descriptive list. Belcher and Bagnall, 40 Cortland St., N. Y.

The Eureka Mower cuts a six foot swath easier than a side cut mower cuts four feet, and leaves the cut grass standing light and loose, curing in half the time. Send for circular. Eureka Mower Company, Towanda, Pa.

Eclipse Fan Blower and Exhauster. See adv., p. 220.

The Newell Universal Mill Co., Office 7 Cortlandt St., New York, are manufacturers of the Newell Universal Grinder for crushing ores and grinding phosphates, bone, plaster, dyewoods, and all gummy and sticky substances. Circulars and prices forwarded upon request.

Blake "Lion and Eagle" Imp'd Crusher. See p. 221.

Ten Double-acting Presses, 8 single-acting Presses, 127 Foot Presses, for sale by The George Place Machinery Agency, 121 Chambers St., N. Y.

L Martin & Co., manufacturers of Lampblack and Pulp Mortar-black, 236 Walnut St., Philadelphia, Pa.

Send to John D. Leveridge, 3 Cortlandt St., New York, for illustrated catalogue, mailed free, of all kinds of Scroll Saws and Supplies, Electric Lighters, Tyson's Steam Engines, Telephones, Novelties, etc.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

Jenkins' Patent Valves and Packing "The Standard." Jenkins Bros., Proprietors, 11 Dey St., New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

The "1880" Lace Cutter by mail for 50 cts.; discount to the trade. Sterling Elliott, 262 Dover St., Boston, Mass.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

Wren's Patent Grate Bar. See adv. page 237.

Power, Foot, and Hand Presses for Metal Workers. Lowest prices. Peerless Punch & Shear Co., 52 Dey St., N. Y.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

For Light Machinists' Tools, etc., see Reed's adv., p. 221.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

4 to 40 H. P. Steam Engines. See adv. p. 221.

Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 337.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 237.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 205.

Peck's Patent Drop Press. See adv., page 236.

Clark Rubber Wheels adv. See page 236.

Elevators, Freight and Passenger. Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

Long & Allstatter Co.'s Power Punch. See adv., p. 220.

Saw Mill Machinery. Stearns Mfg. Co. See p. 237.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Saunders' Pipe Cutting Threading Mach. See p. 237.

For Machinists' Tools, see Whitcomb's adv., p. 237.

Wiley & Russell M'f'g Co. See adv., p. 204.

The American Electric Co., Proprts Mfrs of Thompson Houston System of Electric Lighting the Arc Type.

See Bentel, Margedant & Co.'s adv., page 253.

Clark & Heald Machine Co. See adv., p. 206.

For the Cheapest Process of Manufacturing Bricks, see Chambers Bros. & Co.'s adv., page 254.

Cope & Maxwell M'f'g Co.'s Pump adv., page 252.

Diamond Engineer, J. Dickinson, 64 Nassau St., N.Y.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

Peerless Colors—For coloring mortar. French, Richards & Co., 410 Callowhill St., Philadelphia, Pa.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 252.

See Special Bolt Forging Machine Notice, page 268.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 253.

For the manufacture of metallic shells, cups, ferrules, blanks, and any and all kinds of small press and stamped work in copper, brass, zinc, iron, or tin, address C. J. Godfrey & Son, Union City, Conn. The manufacture of small wares, notions, and novelties in the above line, a specialty. See advertisement on page 253.

Akron Rubber Works, Akron, O., Manufacturers of Mechanical Rubber Goods.

Gear Wheels for Models (list free); Models, Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Philadelphia, Pa.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 253.

Comb'd Punch & Shears; Universal Lathe Chucks. Lambertville Iron Works, Lambertville, N. J. See ad. p. 253.

Reed's Sectional Covering for steam surfaces; any one can apply it; can be removed and replaced without injury. J. A. Locke, & Son, 40 Cortlandt St., N. Y.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 252.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

Rowland's Vertical Engine. Wearing parts of steel. Broad bearings. F.C.& A.E.Rowland, New Haven, Conn.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

Tyson Vase Engine, small motor, 1-33 H. P.; efficient and non-explosive; price $50. See illus. adv., page 252.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 252. Totten & Co., Pittsburg.

Use Vacuum Oil Co.'s Lubricating Oil. Rochester, N.Y.

For Thrashing Machines, Engines, and Horse Powers, see illus. adv. of G. Westinghouse & Co., page 253.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) G. C. asks how to restore to its original brilliancy glass or crystal ware that has been stained by sea water. A. There are two ways to accomplish this: one is to slowly heat the glassware to low redness in a muffle or seggar furnace, and then let it cool down very slowly. It requires nice manipulation, and is expensive. The other is to polish the surface of the glass all over with a piece of chamois leather loaded with finest putty powder or rouge (free from grit) moistened with water. As the discoloration is merely superficial it usually yields readily to this treatment.

(2) S. Bros. ask: 1. What quantity of lime is taken to proportion of stearine (ordinary article) to produce stearate of lime? What quantity or proportion of sulphuric acid to stearate of lime to produce stearic acid (the good quality of stearine harder than the ordinary and more gloss to it)? A. About 11 per cent pure caustic lime (equal 16 per cent hydrate) and about 2 parts acid to one of lime (theory requires 1·75). 2 What acid is most suitable to combine beef fat oil with caseine in the manufacture of cheese? A. No acid is necessary. (See page 175, current volume.) 3. What machinery is used in the refining of cotton seed oil? What is the best method to make this oil perfectly tasteless A. A deep narrow wooden tub, provided with a stirring apparatus and pipe for injecting steam, and a wooden cylinder filled with coarsely granular animal charcoal for filtering. Heat the oil to about 120° Fah., by steam injection, and add for every 100 lb ½ lb. bichromate of potassium dissolved in hot water; agitate violently, and add, first, 1 lb. strong hydrochloric acid, then gradually, ¼ lb. sulphuric acid. Continue the agitation for half an hour, then add a volume of water about equal to that of the oil; agitate for a few minutes, and let rest to separate. Draw off the water, blow steam through the oil for about 15 minutes, then pass through the bone black filter slowly.

(3) J. H asks: 1. What will keep glue in a liquid state continually without injuring its adhesiveness? A. Heat the pure glue solution for about 12 hours in a Papin's digester at 300° Fah. The glue will remain liquid on cooling. 2. What number SCIENTIFIC AMERICAN SUPPLEMENT has recipe for liquid glue for wood? A. See SUPPLEMENT, No. 158.

(4) E. E. P. asks: How do you cut, or how do you prepare isinglass to be used as a varnish? A. Isinglass—fish glue—dissolves in hot water or in hot dilute wine spirit. Mica—sometimes improperly called isinglass—cannot be dissolved so as to be used as a varnish.

(5) S. P. Co. write: We are desirous of obtaining the recipe for japanning castings and goods of our manufacture. We have used coal tar and also asphaltum, but it does not leave the gloss and finish which we notice on Eastern castings and malleables which come to this coast. We judge there is a preparation for japanniug in which they dip the castings. A. The following is a common method. The work is simply coated with good drying linseed oil and heated in an oven, at first just hot enough to turn the oil black. The heat is then gradually raised (as high as may be without burning it), and kept up for an hour, or until the coating, when cold, is hard enough for service.

(6) F. A. R. writes: 1. In SCIENTIFIC AMERICAN SUPPLEMENT, No. 143, page 2276, an article written by Thomas Bolas, Esq., F.C.S., upon "Printing Surfaces and Pictures by Photography," in the last line of second column he says: "Next I put some thick gum water on the stone," etc. Please inform me regarding the gum water he meant. All the other directions are explicit, but I have failed to find any gum to which printer's ink will not adhere. A. Use gum arabic dissolved in warm water. 2. I desire to make two gas bags to hold H and O of about 45 gallons capacity each. I wish to know if I can successfully make them out of heavy cotton cloth? A. See answer to F. M. W. (21), page 186, current volume.

(7) P. N. asks: 1. How are rubber stamps or type made? A. See "How to Make Rubber Stamps," SCIENTIFIC AMERICAN SUPPLEMENT, No. 83. 2. Why is it that melted lead will not take the form of letters taken in plaster of Paris? The lead does not seem to reach the bottom of the cast. Why is it? A. The metal chills too quickly. It is necessary to heat the mould. Try type metal instead of lead.

(8) A. H. M. asks: Is there a substitute for alcohol to be mixed with whiting to keep it from freezing instead of using clean water—something that will do to clean windows and glassware with? Alcohol is too costly and evaporates too quickly. A. The addition of a small quantity of glycerine to the water with which the whiting is mixed will keep it from freezing and will not interfere.

(9) W. G. asks for the process of removing the gloss from diagonal cloth, caused by wear. A. Brushing over with the following preparation will in some cases revive the appearance: Extract of logwood, 1 oz.; sulphate of iron, ¾ oz.; hot water, 1 pint. Where the nap is worn off there is no permanent remedy.

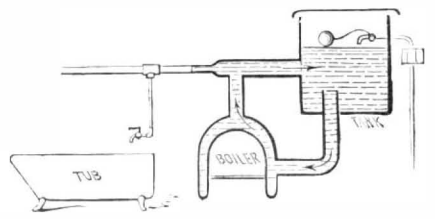
(10) J. J. H. asks: What kind of flexible paint is used in making table oilcloths? A. Size with hot soap and alum solutions, used alternately, dry and enamel with colors ground fine in oil with plenty of driers and a little turpentine. Finish with a thin copal varnish if high gloss is desired. Harden by drying at about 200° Fah.

(11) F. J. W. writes: If you can give me any information concerning what follows you will much oblige me. I presume it is settled that the freezing point of water (or melting point of ice) is 32° under ordinary conditions. Since ice, however, after being formed may suffer a further loss of heat, like any other solid, it follows that ice is often cut and stored when at a much lower temperature than 32°, say, for instance, at 12°. Now, without having made any experiment, I should suppose (as ice is a good conductor of heat) that, if it had been stored for any length of time or exposed for even a short time to a temperature of 32° or above, it would abstract sufficient heat from its surroundings to raise its own temperature to about 32°. I have been told, however, that if ice is cut and stored when at a temperature of 12° that months afterward, although transported in hot weather, it would still have its original temperature of 12° instead of having risen to 32°. I do not know whether the parties themselves had made the experiment, but they claim that if a hole is bored to the center of a block it will show the original temperature of 12° no matter how hot the weather may be. As I have generally lived much further south, I have had no opportunity of experimenting, and thinking you might know something of the matter, I have ventured to apply to you. A. Ice is a poor conductor, and where the temperature prevailing at the time it was found was much below 32° Fah., the center of a large block frequently has a temperature below the freezing point even when the surface is melting. If kept at a little below 32° for some time the whole block will eventually have about the same temperature.

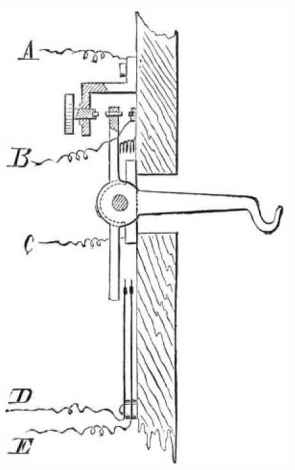
(12) E. N. T. asks: 1. How many cubic feet per minute of steam at 60 lb. pressure will flow from a nozzle, ¼ inch bore and ½ inch long, to where it widens out to ½ inch diameter? A. 18·2 cubic feet per minute, at 60 lb. pressure above atmosphere. 2. How many pounds of coal per hour will be required to generate the steam used? A. Twenty-six to twenty-eight pounds.

(13) C. A. P. writes: I have some graduated paper circles cemented to iron disks. With what shall I varnish them that they may stand the weather, without making them transparent or difficult to read? A. Dissolve 1 oz. best isinglass in about a pint of water by simmering it over the fire and strain through muslin. Try the size moderately warm on a piece of paper; if it glistens it is too thick, add more water; if it soaks into the paper it is too thin, add isinglass; when of proper consistence it should merely dull the surface. Give the paper two or three coats, letting each dry, with care (particularly in the first coat), to bear very lightly on the brush, which should be a flat camel's hair from which the size should flow freely. When all is dry give three coats of thin dammar varnish.

(14) W. H. M. asks how to supply hot water to a bath house. A. Probably the cheapest and best way to furnish hot water for a bath house, cost of plant and maintenance considered, is to set up a small cast iron boiler (saddle or any other good hot water apparatus boiler) and connect the same with an open tank, the latter to be at least large enough to contain four times the water that can be used at one time in all the tubs. The tank should be furnished with a water connection and ball cock to keep the same level of water always. The height and diameter of the tank should be about the same; wood will do, iron is better. The following diagram shows the connections and their positions. A boiler connected this way will not fill with lime or magnesia soon; it will be found in the bottom of the tank.



(15) J. H. S. writes: The sketch shows a commutator which can be applied to such a telephone as was recently described in the SCIENTIFIC AMERICAN.



A, to line through secondary and receiver. B, to line through bell magnet and signal key. C, to ground. D, to battery. E, to battery through primary of induction coil and transmitter.

I have used it more than a year in my house and it works very satisfactorily. It will be noticed that it is automatic to open as well as to close the telephone and bell circuits, and also operates the local battery circuit. The weight of the receiving telephone when suspended from the hook makes contact with the anvil and closes circuit from line through bell to ground, and the instrument is in a position to receive a call. In this circuit and outside of the bell is placed an ordinary spring key having top and bottom contact, by depressing which the current of the call battery is sent into line and operates the bell at other station where a similar instrument is placed. When the receiver is taken from its hook the small coiled spring causes the instrument to release the anvil contact, thus cutting out the bell, and through the top contact puts into line the receiver and secondary. The lower arm of the lever presses the two light springs together and closes circuit of local battery through transmitter (microphone) and primary. These springs should be very thin, so as to give less resistance to the movement of the hook than the coiled spring, otherwise they might prevent a proper contact of the upper arm of the lever.

(16) O. L. C. asks: 1. Would two Daniell's batteries be sufficient to ring a bell on a circuit of 250 yards, the bell being that distance from the batteries? A. Yes. 2. If by using the city water pipes as another return wire, would the bell ring equally as well so as to enable me to ring from either end, and leave the batteries at one end of the line? A. Yes. 3. In making a telephone does it make any difference which pole of the bar magnet the spool is on, or what direction it is wound on the spool? A. No.

(17) W. P. M. asks: Can you tell me how to prepare a cheap colorless varnish for iron pans, such as bread pans? A. Wine spirit, 1 qt.; pale shellac, 2½ oz.; digest and agitate until dissolved and strain through a fine cloth. Warm the clean article and apply quickly and evenly with a soft brush. Varnish of any kind should not be used on the inside of culinary vessels. A trace of oil will usually keep the metal clean under ordinary circumstances.

(18) P. J. writes: I wish to establish telegraphic communication between two points separated by a body of water of 200 feet in width. Only signals, produced on electric bells at each end of the line are to be used. What I wish to know is this: 1. Will the wire used to connect stations have to be insulated? A. Yes, they will be submerged. 2. If insulation is necessary, what is the best wire to use? Would like it as small in diameter as possible. A. Kerite or gutta percha insulated. No. 18 copper wire will answer. 3. Will there have to be two lines of wire, or is one sufficient? A. With a good ground one wire is sufficient. 4. Will there have to be a battery at each end of the line? A. For open circuit, yes. For a closed circuit you may use a battery at one end of the line. 5. Is there any form of small and compact electric generator of any kind which could be used at one of the stations instead of a battery? A. There are magneto-electric calls in market which take the place of batteries.

(19) J. A. W. writes: 1. I wish to construct a small sectional boiler for an engine 3x6; please inform me whether common gas pipe is suitable for the

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purpose. A. Common gas pipe not suitable; you should use sap-welded tubes. 2. At what speed of said engine can I attain the greatest power? A. With the same pressure, the higher the speed the greater the power.

(20) W. S. K. asks: With a given cylinder, say 12 inches diameter, why will one engine cut off at ¼ stroke and another at ⅛ or ¾ stroke; that is, what different conditions must exist? Will not the one which cuts off at ¼ stroke use less steam and thus result in a saving of fuel? Understand that both engines are same horse power. A. The one with the short cut off will be most economical, but will not give out so much power as the other with a given pressure of steam.

(21) J. H. C. W. writes: About two months since I moved into a new house, and although, of course, we are constantly using hot water, the water is sometimes very thick and muddy with iron rust, always darkly tinted; it is worse when the range fire has been fiercer than usual, ironing days, etc. Can you tell me any way of stopping the trouble? A. We know of no better method than heating up the water in the tank and then running it off as rapidly as possible, repeating the operation till the pipes and water back are cleaned out.

(22) C. L. J. asks for a receipt for coloring white soap a light yellow. I am making an excellent soap, but find it difficult to sell it because it is not yellow. I have added rosin, but that makes it too dark. A. Color with solutions of annatto and turmeric.

(23) P. J. B. asks how to tin light wire work, and wants a metal that will run freely and smoothly and not leave any drops, as there is no opportunity to brush or rub off any superfluous metal. I have used all ordinary alloys used in tinning, to wit: pure tin, tin and lead; tin, lead and bismuth; tin, lead, antimony, and bismuth; and have cleaned my work (before dipping) in dilute sulphuric acid, then thoroughly rinsed in pure cold water, then dipped in muriate of zinc, then into my bath of metal, which is covered with tallow to the depth of one-eighth of an inch. I have frequently found wires with a scale that I cannot remove with the sulphuric acid. In dipping a piece of straight work, the wires being about ten inches long, if I draw it out lengthwise of the wire the metal will remain on too thickly, and if I attempt to shake it, it will cool and set in ridges. Do you know of any method for doing away with these difficulties? A. Pure tin, or tin with a little bismuth, will answer about as well as anything. Try dipping the tinned article in very hot grease until the coating is equalized. In such work the wire is usually tinned in the coil and finished in the grease pot or by passing through a loose draw-plate on cooling. If the wire is much oxidized use a stronger pickle, or give a longer exposure in a dilute hot pickle. If oily, dip in hot potash solution and rinse in plenty of water first.

(24) J. T. W. writes: 1. I propose laying a two inch wrought iron pipe, 5,000 feet in bed of a stream which falls in that distance 20 feet. How much water would said pipe deliver by natural flow? A. 16 cubic feet per minute. 2. How high would it rise vertically from lower end? A. As a jet, not over about 12 feet, but in a steady pipe the height of the head. 3. With a stream pump attached how much could be drawn through it? A. 2·66 cubic feet per minute.

(25) A. W. D. writes: We have a backlash in the bevel gearing on crank shaft and upright shaft in a flouring mill. Some say that it is caused by the governors on engine, and some say it is caused by mill machinery; and to test the governors I weighted down the stem so as to use boiler pressure, and regulated speed by the throttle valve, and it backlashed just the same as it did when running with the governors. Increase of speed increases the trouble alike in both cases. Was that a sufficient test for governors? We have an irregular feed on one of the burrs. Do you think that would cause a backlash? A. Your fly wheel is too small. Increase its diameter at least two feet.

(26) A. S. F. asks: 1. Can you tell me how many pounds (troy) of metallic sodium and water are required to produce ten cubic feet of hydrogen gas (at 60° Fah.)? A. 1 lb 6 oz. sodium and 1 lb. 2 oz. water. 2. What are the relative weights of ten cubic feet of hydrogen and a like volume of atmospheric air (at 60° Fah.). A. Ten cubic feet of hydrogen weigh about 0·77 oz.; the same volume of air under like conditions about 11·16 oz. 3. What measure and weight of oxygen gas will this quantity of hydrogen require to form water? A. 5 cubic feet, equivalent to about 6·16 oz. 4. How much oxygen does atmospheric air contain on an average? A. About 20 per cent. 5. How much oxygen can be obtained from chlorate of potash. A. 16 oz. will yield about 5 cubic feet of the gas.

NEW BOOKS AND PUBLICATIONS.

ILLUSTRATED CATALOGUE OF THE PLUMBING AND SANITARY DEPARTMENT OF THE J. L. MOTT IRON WORKS. 1881.

Contains upwards of six hundred engraved illustrations of as many styles of plumbing and sanitary appliances, lamp pillars, and stable fixtures. The high character of the products of this establishment, both with regard to artistic design and the quality of the iron and enamel, is known everywhere. The scientific construction of the various sanitary devices here illustrated will commend them to prudent house owners and architects. The stable fittings in cast and wrought iron show some remarkably artistic designs.

BRIGHT FEATHERS. By Frank R. Rathbun. Auburn, N. Y.: the Author. Part I. Quarto, paper, pp. 24. $1.

Mr. Rathbun has chosen the purple finch for the initial number of this series of ten or more illustrations of the most attractive of the birds of our northeastern States. Each number will carry a plate figuring the male and female of the species described. The figures are carefully drawn from nature and colored by hand.

MODERN ARCHITECTURAL DESIGNS AND DETAILS. New York: Bicknell & Comstock. Parts IV. and VI. $1.

Part IV. comprises plates 25 to 32; store fronts and details; plans and elevations of a country house by Cabot & Chandler, Boston, with many details of porches, windows, gables, etc.; cornices and belt courses. Part VI, plates 45 to 48, contains perspective views, plans, and elevations of two country houses, with many exterior and interior details. Part V. was noticed some weeks since.

[OFFICIAL.]

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A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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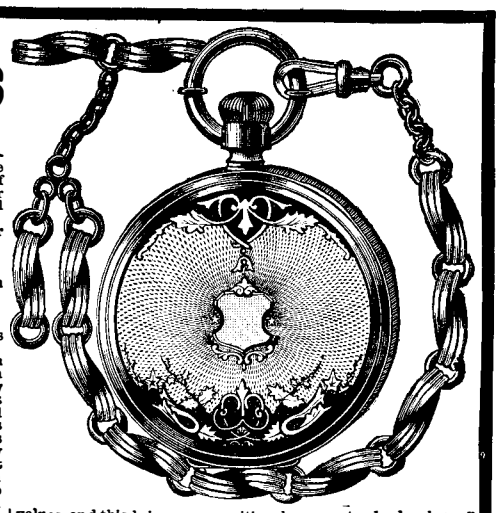
E. G. RIDEOUT & CO.'S
SOLID ALUMINIUM GOLD CASED WATCHES
THE BEST WATCHES IN AMERICA.



THE cases of these Watches are made from a metal discovered in Switzerland, February 15th, 1878, and we are now introducing it for the first time in this country. Aluminium is the only metal discovered that keeps its color and never tarnishes. It costs more than other so-called metals, the foundation of which is brass and grows black after a short time. Our Aluminium cases contain a percentage of pure gold, without which no metal can be made that will keep its color. Life-long experiments have disclosed the fact that a certain percentage of gold used in conjunction with several other metals, will produce a metal equal in appearance and durability to pure gold, though not of the same intrinsic value. The works of these Watches, like the works of all our watches, are of the best make of American Watches. The cases so closely resemble gold, both in density and color, that the most skillful jewelers cannot detect the difference. They retain their brilliancy as long as gold. They are jeweled and well finished, and taken altogether present the same appearance as a Gold watch worth $200. Previous to September last we invariably charged $18 to $20 to citizens coming into our store, and they had abundant opportunities for examining them.

Beautiful and well-finished Chains of the same metal, at $4, $4, $5 and $6 each. Chains are sold at half-price when ordered with the watches, or by the half dozen. No other other house in the world offers watches at so low a price, and we are enabled to do this because we buy the movements direct from the manufacturers, and manufacture our own cases. Moreover, all our Watches are good time-keepers. We send none out but those which have been tested by our workmen for a considerable length of time. No Watch is allowed to leave our establishment, no matter how pressing the order may be, until it has been thoroughly overhauled, regulated, and made to correspond with the standard time-keeper. Therefore, those who purchase of us have every right to expect a first-class time-keeper for their money; and they may depend upon it that we will make every exertion to meet their anticipation.

We claim the following merits for the Watches sold in our establishment, and for those sent abroad:

1. That they will not vary, if wound up regularly.
2. That the cases will retain the color of gold.
3. That the best jewelers cannot distinguish them from Gold Watches.
4. That the jewels are genuine and not false.
5. That the movement is the genuine American.

In short, we claim for our Watches every merit that is claimed for any Gold Watch costing $150 or $200.

The Movements are all Encased in Aluminium Gold Cases of the latest pattern. No jewelry, however high in price, surpasses this in beauty, workmanship, or in any respect, except value. It equals that of gold, which costs nearly ten times as much. The discovery of this compound was characterized by all the leading jewelers as well as ourselves, as being invaluable, for the reason that millions of dollars' worth of gold was annually worked into jewelry and watch cases, thereby taking from circulation that immense amount of money, which keeps the European and American money markets cramped for coin. The importance of the discovery of this compound for gold can be seen at a glance by all educated people, as it will, in every case, answer the purpose of VIRGIN GOLD, except for the coining of money For that, of course, it will not answer, for the reason that virgin gold is the basis of all values, and this being a composition, has no standard value, or we could not afford to encase the movements of the Watch with this Gold Metal, and sell the watches complete for that price, as the works are the same as in a genuine gold case.

TESTIMONIALS.—We submit the following extracts of letters from parties at a distance, whom we never saw, and of whom we knew nothing except that we dealt with them by mail and express. Those who desire to assure themselves of the genuineness of the testimonials will do well to address the parties. We have too many letters of this sort, from different parts of the country, to resort to the usual method of writing fictitious ones:

ELMIRA, N. Y., January 1st, 1879.

DEAR SIRS—I have been a conductor on the N.Y. Central R.R. for the past fifteen years. In that time I have had several watches in my possession; some were good, but most of them were wanting in one or more of the qualities of a reliable Watch. I ordered one of your Watches in May, last year. I have run my train by it every day since. I wind it up regularly at 12 M., and it has not varied half a minute during the time it has been in my possession. It retains its original color, and in every respect is the best watch I ever had. You may publish this if it will promote your interests.

HIRAM FORBES.

JACKSON, Mich., October 20th, 1879.

I received your six watches all right the day before yesterday, and have sold them all but one. I am perfectly delighted with them, and all those to whom I have sold them express themselves perfectly satisfied. EDWARD HUGHES.

NORA, Mich., August 3d, 1880.

DEAR SIRS—I sold the Aluminium Gold Watch that I ordered of you some time ago, this day, for $54.50. Will send for a dozen soon. Truly yours, F. W. SALSBURY.

THE LATEST.

GREAT FALLS, N. H., March 9th, 1881.

GENTLEMEN—The Aluminium Gold Cased Watch which I ordered of you four months since, was received in due time, and I am perfectly satisfied with it. It retains its original color perfectly, and is the BEST time-keeper I ever owned. Every one supposes that my Watch is solid Gold and cost $100, or more. With best wishes, I remain, Very truly yours, C. E. JEFFREY.

WE HAVE HUNDREDS OF LIKE TESTIMONIALS FROM ALL PARTS OF THE U. S.

OUR TERMS.—The price of each watch is $15, or three for $30, six for $50, twelve for $90. No house in the world offers such watches at such a price. We are enabled to do this because we manufacture our own cases, and the movements are made to our orders.

HOW TO SEND MONEY.—Send money by Registered Letter, P. O. Order, or Bank Draft at our risk. If you want watches sent C. O. D., you must remit at least three dollars to five dollars with the order, to insure us against loss of express charges in case you do not pay the C. O. D.

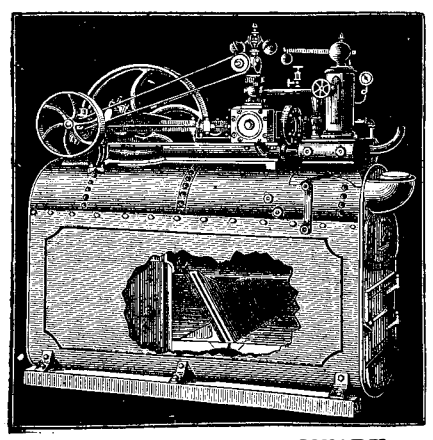
Persons living away from an express office can have their watches sent by Registered Mail by sending full amount with the order, and 25 cents to pay postage and registration. When sent by mail registered, they are as safe as by express.

READ DECIDE AND ACT.—In order to get our Aluminium Gold Metal Watches introduced throughout the country, we will make the following offer to all who contemplate taking an agency. We will forward one of our watches as a sample, **WITH A SPLENDID CHAIN** for **TEN DOLLARS**, which is $7 less than the retail price, and Seven Dollars less than we ever offered a sample one before. We do this for the reason that we well know if a person buys one we will be sure to send him a half dozen or dozen the next time, as we have ever known it to fail.

Please do not confound our ALUMINIUM Gold Case Watch with the cheap metal and utterly worthless watches sold by some dealers. ☞ Address

E. C. RIDEOUT & CO., 12 Barclay St., N. Y.

REMEMBER WE SEND YOU A SAMPLE WATCH AND CHAIN FOR ONLY $10.00. **CUT THIS OUT—IT WILL NOT APPEAR AGAIN.**



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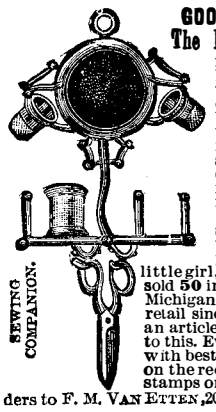

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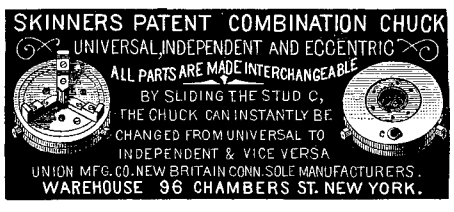
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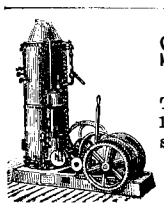

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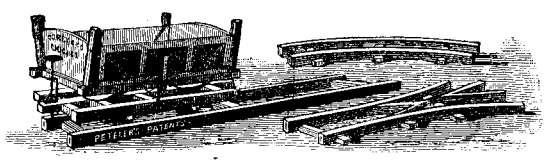

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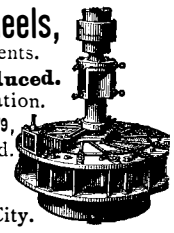

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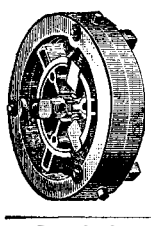

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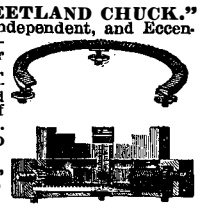

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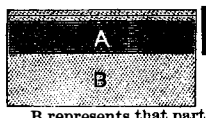

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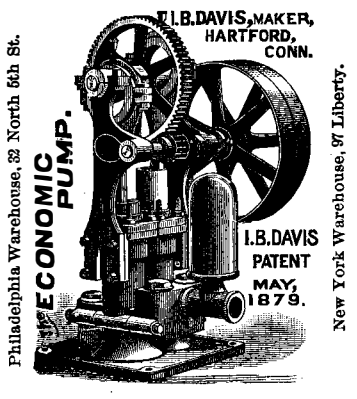
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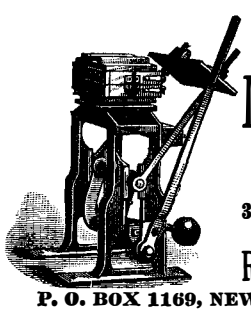

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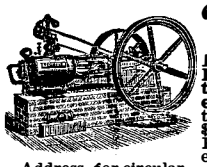

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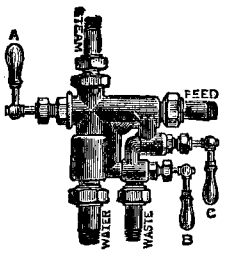

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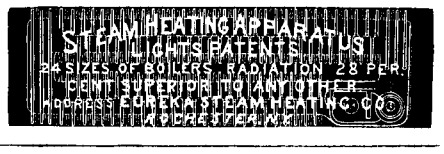

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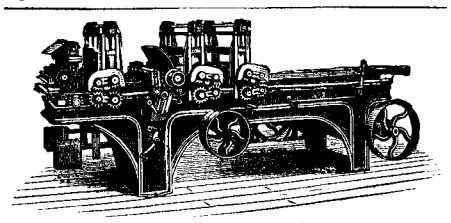

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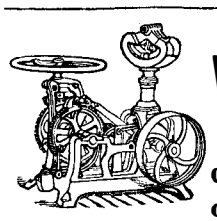

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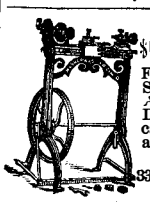

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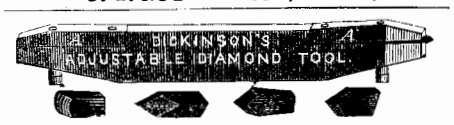

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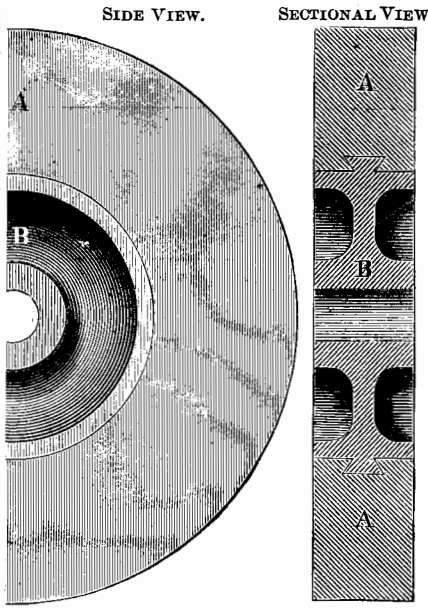

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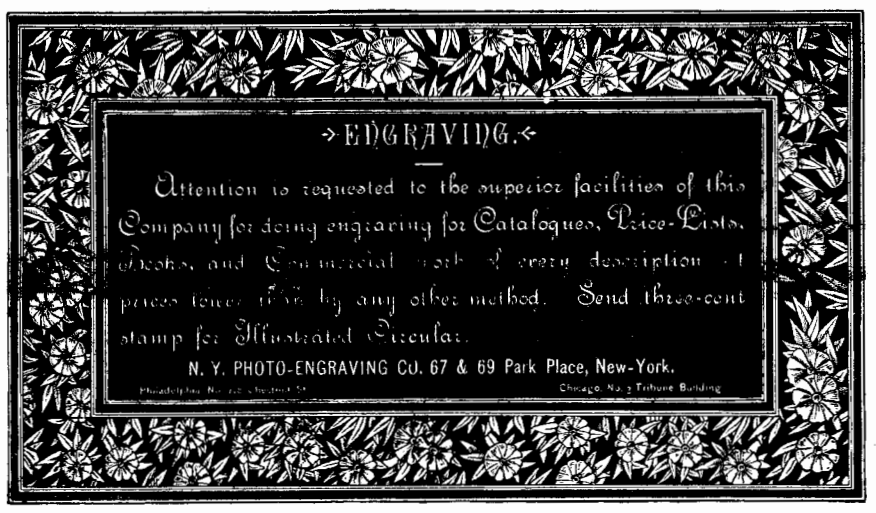
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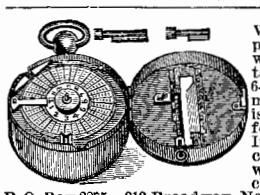
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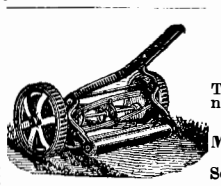
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